GAS JOURNAL, SEPT. 20, 1939

VOL. 227 91st YEAR No. 3983

Editorial Notes

Meeting War Demands

WE emphasized in these columns last week how important it is that the Gas Industry should be assured of adequate personnel to carry out its work efficiently. We said that the present and future national demands require the retention in the Industry of a sufficiency of men who are trained technically to control gas-works plant and operate recovery plant to the best advantage, and that they require also the retention of a sufficiency of skilled research workers, who will be called upon to investigate wartime problems. They will be needed in the development of new processes to meet wartime requirements.

The wonderful flexibility of the Gas Industry's process renders the Industry of enormous potential help to the nation. It can modify its methods of operation in all manner of ways, and it will doubtless be called upon to do so. It is responding to the call for benzole and toluole, to the call for aromatic hydro carbons generally; but it is not difficult to visualize how it could render service in other directions—apart from the supply of gaseous heat to domestic premises and to industry.

In the matter of motor transport the Gas Industry could supply not only gas and benzole, but also reactive coke for use in gas producers for road vehicles. The use of compressed gas for the propulsion of motor vehicles has been shown to be a thoroughly practical and highly satisfactory proposition; and surely it should be encouraged now. It has been urged in peace-time that there should be modifications in the methods of taxation of certain classes of vehicle which are taxed on their unladen weights. It has been found that where, with gas-operated vehicles, the weight of storage cylinders and ancillary gear was included as part of the unladen weight, the vehicles were usually placed in a higher category with a corresponding increase in the amount of the annual tax. This is one reason why development has been retarded. The present position calls for modifications in the methods of taxation which will result in the equipment not being included in the unladen weight for purposes of taxation. Another reason has been the stringent regulations imposed by the Home Office in regard to the cylinders themselves, and in this respect also the present conditions call for review of the position.

Then, of course, there is the question of the availablity of cylinders; and in this regard it may be necessary, at any rate temporarily, to fall back again on the expedient used during the last war—the "gas bag." For motor transport by gas, and this applies to both compressed gas and the "gas bag" idea, it may well be that a gas of a higher calorific value than that of normal town gas will be called for, in the production of which tars amenable to hydrogenation will be made. There is also the stationary engine to consider. diesel engines are readily convertible to gas—a matter of obvious importance to the Gas Industry. As already mentioned in the "JOURNAL," a high-compression engine has been evolved which is identical in operation, except for a new type of carburetter, with the ordinary stationary diesel engine, and diesel engines of any make may be quickly converted at small cost, and without loss of efficiency, to the gas-driven principle. A thermal efficiency of 40% compared with 26% previously with gas has been achieved.

We have referred to the production of reactive coke suitable for use in a gas producer, and this should not be difficult of attainment by the Gas Industry. Indeed, the work carried out jointly by the Edinburgh Gas Department and the Fuel Research Board, reported at the last Autumn Research Meeting of The Institution of Gas Engineers, has shown the way. That work, it will be recalled, was concerned with the production of smokeless fuels for domestic purposes using the plant and methods of gas manufacture in continuous vertical retorts. The known reactivity of the coke made from weakly-coking coals was utilized by making a careful choice from Fuel Research Station survey records. The temperature of carbonization was reduced so that the coke was not heated for any length of time above 700° C. The coke produced was free burning in the ordinary firegrate, and, maybe, after some slight modification of the process a product could be obtained which would be eminently suitable for use in the portable producer.

The foregoing are immediate practical possibilities. Looking further ahead and having regard to the Industry's potentialities there is the production of water gas and the synthesis of oils, and in this direction also much valuable work has been and is being done by the Gas Industry and the Fuel Research Board.

Iron and Steel Priorities

As a substantial user of iron and steel in the erection and maintenance of its plant and the manufacture of its appliances, the Gas Industry has a vital interest in the Control of Iron and Steel Order made by the Minister of Supply under the Defence Regulations. The Order provides that no-one shall acquire any iron or steel (as described in Schedule 1 of the Order) except under licence, "provided that the Minister may by notice make such exemptions of persons or classes of persons or otherwise howsoever as he may think fit from the requirements of this paragraph under such conditions as may be stated in the notice." Appended to the Order is a Notice giving priority, by removing the restriction as to licence, to the following: (1) Government Defence Departments;

(2) Other Government Departments ; (3) Local Authorities for civil defence purposes ; (4) Persons requiring supplies under the Civil Defence Act, 1939, or otherwise for air raid precautions ; (5) Railway companies for repair and maintenance work ; (6) Shipbuilders, ship repairers and marine engineers ; (7) Collieries ; (8) Persons having agreed prior to the date of the Order to purchase material, for the purpose of delivery against such purchase subject to priority being given to deliveries under 1 to 7 ; (9) Persons purchasing from stockholding merchants out of their stock for urgent requirements during 14 days from the date of the Order ; (10) Persons purchasing quantities of 10 cwt. or less. There is no preferential priority as between users 1 to 7, nor as between 8 to 10, though users 1 to 7 have priority over those under 8 to 10. In passing, we might mention for the information of scrap merchants that scrap iron and steel fit only for the recovery of metal or for reprocessing may be supplied and received without restriction as to licence until further notice.

It is noteworthy that neither the Gas Industry nor any other public utility is placed in the priority class, so that, for the present at any rate, licences will be necessary for the purchase of all the iron and steel required by the Industry. Applicants for licences must give full particulars of description and quantity of materials required, description of the job for which they are wanted, particulars of any other licences issued or applications for licences made for iron and steel in connexion with the same job, the name and address of the customer and name and address of the firm(s) from which the supply is desired. The Order is being administered by a controller under whom there are directors responsible for dealing with different classes of materials, and although in the short time since it was introduced the Order has worked quite smoothly there is reason to believe that experience will reveal directions in which the list of priorities should be adjusted to meet the more or less normal requirements of the nation without detriment to the progress of defence. That such modifications are in fact contemplated is shown by the passage we have already quoted from the Order, coupled with the further statement that " any notice given by the Minister . . . shall be published in such manner as shall appear to him to be best adapted for informing persons affected, and shall have effect from the date of such publication."

The Gas Industry has no quarrel with the principle of control, but it does feel that when the priority list next comes under review the essential services which it renders should be deemed to be of such importance as to relieve it of the present licence restriction. In these early days of hostilities we may well take a broad view of the Control Order, feeling confident from what we know of those who are entrusted with its operation that due regard will be had to the needs of the Gas Industry, not only in the immediate case of licence applications but in connexion with the granting of a greater measure of priority at the earliest opportunity.

Centralized Research

IN to-day's issue of the " JOURNAL " we publish an illustrated description of the extensive new Headquarters at Aston, Birmingham, where research work on behalf of the Gas Industry will in future be carried on by Radiation Ltd. In times like these it is, to say the least, highly encouraging that this important firm of gas appliance manufacturers, which for so many years has helped the Industry's progress by its well planned and skilfully executed research activities, should act courageously and wholeheartedly on the motto " Business as usual." On many occasions in these columns we have referred to the excellent research work of Radiation Ltd., which has been instrumental in the development of gas consuming appliances as we know them to-day. It is twenty years since the research work of the amalgamating companies of the Radiation group was co-ordinated, and Research Laboratories at 15, Grosvenor Place were opened in 1925. Work of fundamental importance has been carried out continuously there by a highly trained scientific staff under capable guidance and direction, and it has wrought a change from crude to refined methods of test and means of production. New developments have been fully proved from all angles before the appliances incorporating them have been placed on the market. There is no need for us to emphasize the soundness of this policy, which has resulted in so much benefit alike to supplier and user of gas, and which has proved such a bulwark against competition.

It was in 1937 that new and enlarged Laboratories were erected in Birmingham, and arrangements were made to permit of the housing of the whole of the research, development, and drawing office staffs in the one section. Now, in view of the rapidly expanding scope of the work in hand, Radiation has found centralization more necessary than ever, and the decision has been taken to transfer the remaining members of the research staff from London to the Central Laboratory in Birmingham. The transfer was completed on Friday last, and the move, we anticipate, will result in still greater technical service to the Gas Industry during a period when such service, in coping with new problems, will be of paramount importance.

Our account of the new premises on later pages gives an idea of the extent of the work undertaken in the Radiation Central Laboratory and the completeness of the testing equipment installed. The Laboratory is divided into eight sections to deal respectively with general work, chemical, physical, metallurgical, gas analysis, solid fuel, enamelling, and production ; and associated with these laboratories are well-equipped experimental and demonstration kitchens which operate in conjunction with the Home Service Section. The chemical and physical apparatus has in the main been specially designed ; all the necessary equipment is available for every type of analytical work concerned with technical development and works control. The highly developed integrating radiometer, which enables the radiation output of a heater to be determined in a few minutes, is installed. There are the necessary instruments for the determination of flame characteristics, involving the rapid measurement of air-gas ratios, flame speeds, and temperatures. An X-ray installation is provided for the diffraction analysis of materials. This is used principally in enamel research for such work as the investigation of changes occurring during the manufacture of frits and the subsequent fusion of the enamel on the article. Direct measurement of the thickness of coatings on iron and steel is made with an instrument specially developed by the Central Research Laboratory staff. We refer here to these few pieces of equipment merely to indicate the thoroughness with which the new premises have been planned and how this efficient research organization is the outcome of many years of unremitting effort and far-sighted vision. Radiation Ltd., can feel justifiably proud of its achievement in research, and the Gas Industry will congratulate the firm on its latest move and, with us, will wish success to the enterprise.

Institution of Gas Engineers

It has been decided that the Offices of The Institution of Gas Engineers shall remain, until further notice, at Gas Industry House, London, S.W.1, from where the Institution's contacts with its members, with the Gas Industry in general, and with Government Departments, can, for the present, be most effectively maintained. The normal business of the Institution, including the administration of the Education Scheme, will be carried on, as far as possible, as usual, although Council and Committee meetings will be greatly reduced in number.

The following small Emergency Panel has been appointed with power to deal with matters requiring immediate action or decision: Mr. George Dixon (President), Mr. E. V. Evans, Mr. R. W. Hunter, Mr. Stephen Lacey, Mr. F. B. Richards, and Mr. H. C. Smith.

The 11th Autumn Research Meeting, which was to have been held in London on Nov. 21 and 22, 1939, has been indefinitely postponed. Reports of Committees and contributed Papers, which would have been presented at the Meeting, will be published as usual.

The Gas Research Board

At a meeting of the Council of the Gas Research Board, held on Sept. 15, it was decided to postpone the appointment of a Director of Research for the Gas Research Board. In view, however, of the present state of war and the vital necessity of maintaining the closest contact in technical and scientific matters between the Gas Industry and Government Departments, the Council of the Board, with the approval of The Institution of Gas Engineers, appointed Dr. W. T. K. Braunholtz as Acting Director of Research for the Gas Research Board. Dr. Braunholtz will continue, in addition, to be the Secretary of the Institution.

Quarterly Gas Rations

In the course of the next few weeks all domestic and small-scale industrial consumers of gas will receive a notice telling them what their gas ration in a quarter will be. In a notice in *The Times* last Friday consumers were advised to read their meters weekly, converting the cubic foot readings into therms. Explanation of how this is done was given. The same notice published B.C.G.A. hints to housewives to enable them to face the twin problems of reducing gas consumption and getting greater service from their gas supply.

Letters to the Editor

Tar Fog Removal and Oxide Purification

SIR,—In the Paper entitled "The Relation of Tar Fog Removal to Oxide Purification" read at the Symposium on Gas Purification held in Manchester on March 3, 1939 (abstracted in the "GAS JOURNAL" on March 15, 1939, p. 737), it was mentioned that in three cases where tar fog had been precipitated electrically from coal gas at a comparatively high temperature (say, 60°-80°C., 140°-176°F.) the gas on passing through the oxide purifiers deposited at least as much tar as (sometimes much more than) it had done before the installation of the electrical precipitator, in spite of the fact that the major part of the tar fog had, it was thought, been precipitated from the gas. Up to 6% tar in oxide used on gas purified electrically in the hot state from tar has been recorded.

A very interesting letter from Mr. A. E. Brett, the Engineer and Manager of the Johannesburg Gas-Works, has recently been received, which adds considerably to our information on this matter, and shows the danger of attempting to precipitate tar fog from the hot gas. Following is an abstract from Mr. Brett's letter, which I give with his permission:

"The plant is a Glover-West vertical installation and the temperature of the foul gas at inlet condensers averages 140°F. When our detarrer was installed it was placed at the inlet condensers to treat this hot gas, but before long it was realized that this was the wrong position. There is no doubt the gas was stripped, but unfortunately a large quantity of light oil condensed subsequently apart from the tar and liquor. This oil condensed out of the gas stream throughout the wet and dry purification and, of course, completely destroyed the oxide as a purifying agent. The oil contained a large quantity of naphthalene which settled out in all the pipes and seal pots in the plant."

Mr. Brett then gives analyses showing that the tar precipitated by the electrical detarrer from the hot gas resembled ordinary coal tar, to which a little light oil had been added (49% distillate at 320°C.), while the oils which condensed subsequently in the condensers and P & A tar extractor were of comparatively low B.P. (about 20% distillate at 180°C. and 90% or more at 250°). The oil or tar which condensed in the spent oxide was not estimated "but was sufficient to make the oxide a soft pulpy mass, useless for purifying purposes."

The position of the detarrer was then changed from inlet condensers to outlet condensers—*i.e.*, to between the condensers and the exhausters, where the gas temperature was about 33°C. (91°F.). Since this change "no trouble has been caused through fouling of the purifiers with tar or oils" and the oxide is now practically free from tar.

Mr. Brett adds that further experience has indicated that the best place for the detarrer is on the pressure side of the exhausters, however, as the steam-driven exhausters of the Waller type in use do not work satisfactorily on de-tarred gas, apparently because there is present no lubricating agent for the blades of the exhauster when all the tar had been removed.

Mr. Albinson remarked during the discussion at the Symposium that the heavy tar fog would, under normal conditions, tend to wash down some of the lighter oils, and I think this is the explanation of the above at first sight rather remarkable happenings, which would appear to depend on the vapour pressure of light oils in presence of coal tar. When the heavy oils and pitch (which amount to more than three-quarters of the tar-fog and vapours) are precipitated and removed from the system in a hot state, they will take with them a much smaller quantity of the lower boiling constituents than if allowed to remain and cool down with the gas to a lower temperature in the condensers. Hence the gas entering the purifiers will be more highly charged with light oil vapours if the electrical precipitator is on the hot gas, and will deposit these if the temperature is lowered even a little. It is also probable that the removal of the heavy tar fog and all solid particles from the hot gas will cause subsequent condensation to be in the form of a mist so fine that practically none of it will separate out in the normal manner before it reaches the oxide.

Yours, &c.,
H. F. TAYLOR.

Manchester Oxide Co., Ltd.
Sept. 12, 1939.

Dispelling Fog

SIR,—Your able discussion of "Fog Research" in the Aug. 9 issue of "GAS JOURNAL" interested me a great deal. While I know of no serious attempt to reduce fog chemically or thermally in this country (some experimental work has been done on a comparatively small scale), I must disagree with your half-hearted acceptance of Prof. Brunt's conclusion that "neither the thermal method, nor any other method yet suggested, appears to offer a solution of the problem of clearing a fog in calm conditions."

In California, the orange groves are periodically threatened with damage from cold air masses which come down the adjacent mountains, slipping under, and displacing upward, the comparatively warm air which would normally cover the groves. This danger is met in two ways. The first is a thermal process, wherein usually small oil-burning stoves are placed throughout the orchard actually to heat the cold air. Natural gas, discarded tyres, wood wastes, and practically any available combustible material are occasionally used to supplement or replace the oil fires. While I do not feel that one would care to have a football field dimpled with stoves, I shall refer to certain elements of this method later. A second method involves the use of large fans (often airplane propellers attached to automobile engines). The fans are located on high towers and blow the warm air down into the comparatively thin underlying layer of cold air, the method being effective when the temperature of the air mixture thus produced is sufficiently above the danger point. Both these methods have been effective in preventing damage.

While I hesitate to suggest a manner of applying these methods to your problem of dispelling "still" fog, several possibilities occur. If the fog is quite still, a sports field could be cleared by the use of a number of heaters dispersed over the field prior to the game. Subsequently, a row of heaters could be left in operation around the edge of the field to prevent encroachment of the fog during the game. Fans supplied with warm air from heating furnaces might be employed to blow warm air across the field, using a row of fans on each side of the field to blow relatively clear air to the field, and possibly displacing the fog with the heated air. It is also possible that whatever method Prof. Brunt has in mind for dispelling drifting fog could be employed for dispelling still fog by establishing a suitable drift with fans.

I feel certain that the area and extent of your football fields are no greater than those of orange fields in which the methods outlined above have been successful. If you have the opportunity to try out something along the lines suggested, I should like very much to know if the results are successful.

Yours, &c.,
L. O. HOWELL,
Industrial Engineer, Testing Laboratories.

A.G.A. Testing Laboratories,
1032, *East 62nd Street, Cleveland, Ohio.*
Sept. 1, 1939.

News of the Week

The Midland Junior Gas Association have decided to suspend all meetings of the Association for the time being.

The Examinations of the Society of Incorporated Accountants, it is announced, will be held in the first or second week of December.

In Consequence of the declaration of war the Hotel, Restaurant & Catering Exhibition which was to have been held at Earl's Court in November, has been abandoned.

The Glasgow Corporation Gas Committee report that the necessary Board of Trade Order for proceeding with the erection of a new waterless gasholder for the south-western area at Helen Street has now been obtained, but it has not yet been decided to invite tenders for the work.

Employees of the Lighting Department of the Dundee Corporation Lighting Committee, who are no longer required under the black-out restrictions, have been transferred to other departments, where they will be required to accept the wages according to the rating in those departments.

The Visit of the Midland Junior Gas Association to the works of Messrs. Mobberley & Perry, Ltd., at Stourbridge, on Sept. 23, has been postponed (at the Association's request). It is also announced by the Association that their other meetings are cancelled for the time being.

The Clitheroe Gas Committee have decided to put the town's waterless gasholder out of commission until further notice. Although the main supply is derived from this holder, the Committee have decided that in the emergency an older one shall be used for the purpose.

Subject to Confirmation by the Corporation at the beginning of next month, the price of gas to all consumers in Belfast is to be increased by 2½d. gross per 1,000 cu.ft., or 2d. net. Increased cost of coal and other considerations have led to the advance which the Manager intimates will not bring in sufficient revenue to meet the extra costs and is only intended to relieve the position for the present.

As a Substitute for Petrol gas is being offered by the Leeds Corporation Gas Department, it is reported, to any motorist who has had his car converted to gas operation. Motorists may now fill up their gas bags or cylinders at the Meadow Lane or New Wortley Gas-Works, and at the Dewsbury Road, Kirkstall, Sheepscar, or Lower Wortley gasholder stations.

New Gas Showrooms at Falkirk were opened on Sept. 19. Owing to the international situation, the lectures and demonstrations which had been arranged have had to be cancelled.

The Price of Gas in Renfrew is to be raised by 2d. per 1,000 cu.ft. The price will now be 9d. per therm or 3s. 4½d. per 1,000 cu.ft., the increase to take effect on the accounts for the second period of 1939-40. The scale of discounts is to remain as at present.

In View of the International Situation it has been considered advisable to postpone until further notice all meetings and gatherings of the Scottish Junior Gas Association (Western District). This action is to be regretted, but all members will appreciate the necessity of it. Notice will be given when it is proposed to commence the meetings once more.

Two Hundred of Bolton's Street Gas Lamps are to come into use again at night, not to relieve the darkness of the town's streets, but as direction indicators for air raid shelters, first aid posts, &c. Mr. H. Hamer, the Lighting Superintendent, is having the glass sides of the lamps blacked out save for the words "Air Raid Shelter" and an arrow, which appear in lettering easily visible in the darkened streets.

The Kitchens of the new modern school at Ripon, Yorks, which was opened on August 26, include a number of Radiation large-scale appliances. Six cookers with "Regulo" automatic oven heat control, two 12-gallon boilers, two 14-gallon steamers, one "Belgravia" hotcloset, and two flat-top iron heaters, have been installed. This school which has been built on the most up to date lines is now fully equipped with the latest gas appliances.

Eight Gas Filling Stations, where motorists can get coal gas fuel as an alternative to petrol, have been established in the city by the Bradford Gas Department. The stations are at the gas-works at Birkshall, Valley and Canal Road, Mill Street, Thornton Road, Low Moor, Clayton, Idle and Eccleshill. Several of these works are now gas distribution centres only. Of Bradford gas, 263 cu.ft. is the equivalent of a gallon of petrol and the cost is no more than the petrol. Advice is given freely as to the fitting of the canvas storage bag and the necessary adaptation of the carburetter. Among the first in the city to take advantage of gas fuel is one of Bradford's biggest motor sales and garaging firms, who had experience of the efficiency of gas fuel during the previous war and who are now making gas fuel bags.

Forthcoming Engagements

Sept.

21.—I.G.E.—Refractory Materials Joint Committee, 2.30 p.m. (at Stoke-on-Trent).

29.—I.G.E.—Liquor Effluents and Ammonia Committee, 11.30 a.m.; Joint Research Committee, 2.30 p.m.

Oct.

3.—I.G.E.—Research Executive Committee, 2.30 p.m.

6.—I.G.E.—Joint Committee on Complete Gasification under Pressure, 14, Old Queen Street, S.W. 1, 3 p.m.

9.—I.G.E.—Finance Committee, 1.45 p.m.; Membership Committee, 2.15 p.m.; General Purposes Committee, 3 p.m.; Benevolent Fund Committee of Management, 4.30 p.m.

10.—I.G.E.—Council, 10 a.m.

11.—I.G.E.—Board of Examiners, 2.30 p.m.

17.—I.G.E.—Gas Education Executive Committee, 2.30 p.m.

26.—Coke Oven Managers' Association.—Annual Dinner, Hotel Victoria, W.C.2.

30.—L.C.C.A.—Annual General Meeting, May Fair Hotel, W.

Nov.

8.—Southern Association.—General Meeting, Hotel Victoria, W.C. 2.

21.—I.G.E.—Council (at The Institution of Mechanical Engineers), 9.30 a.m.; Council (continued), 4.30 p.m.

Personal

Mr. WILLIAM CURRIE, Assistant Engineer and Manager of the Renfrew Gas Department, has been appointed to succeed Mr. D. S. MUNN, the present Engineer and Manager, who retires next month.

* * *

Mr. RALPH HALKETT, Junr., Assistant General Manager of the Sheffield and District Gas Company, has been appointed Sub-District Manager for Sheffield No. 6 District by the Ministry of Transport for the Defence Emergency Organization of Road Transport. He has also been appointed to the Fuel Advisory Committee for the City of Sheffield.

Obituary

The death occurred last Thursday at the age of 74 of Mr. FREDERICK STEVENS, Chairman of Wrexham Gas Company.

* * *

The death took place at Shawlands, Glasgow, on Sept. 8 of Mr. JAMES M'GHEE, who had 40 years' service with Glasgow Corporation Gas Department, retiring in 1936 from the position of Superintendent of Workshops and Showrooms. He was a former President of the Scottish Junior Gas Association (Western District), and was for many years an evening lecturer on technical chemistry at the Royal Technical College, Glasgow.

National Gas Council

Meeting of Central Executive Board

A meeting of the Central Executive Board of the National Gas Council was held at Gas Industry House, on Tuesday, Sept. 12. Thirty-two members were present at this meeting, at which the President, SIR DAVID MILNE-WATSON, Bart, LL.D., D.L., was in the Chair.

Reference was made to the unfortunate accident which had been sustained by Major Kitson, and it was decided that a letter should be sent to him on behalf of the members of the Board, expressing their sympathy and the hope that he would have early and complete recovery.

Mr. E. Astbury (Chief Engineer of the Liverpool Gas Company), who had been nominated by the Manchester District Executive Board to take the place of Mr. G. S. Frith (resigned) was welcomed as a member of the Board.

National Emergency

(*a*) **War Risks Insurance Act, 1939.**—This matter was discussed in detail so far as it affected gas undertakings, and the officers were instructed to take the necessary steps for clarifying the position.

(*b*) **Central Register of persons having Professional Scientific and Technical Qualifications.**—It was decided to send a communication to members of the Council urging that they should encourage all their technical officers to complete the registration forms sent out by The Institution of Gas Engineers. It was considered that this was in the National Interest.

(*c*) **Fuel and Lighting Order.**—It was explained that copies of this Order were not available in sufficient number to enable them to be sent to gas undertakings throughout the country. Copies were being obtained by the National Gas Council and would be sent to all members with explanatory memoranda on gas rationing.

(*d*) **Petroleum Supplies to Gas Companies, excluding supplies for Goods vehicles.**—Particulars of the rationing scheme which comes into force on Sept. 23, together with the steps which the Council had taken to assist gas companies in obtaining adequate supplies, were considered.

(*e*) **Certificates of Priority.**—The existing position was explained and the Officers were instructed to send circulars to all members of the Council with regard thereto.

Coal

It was reported that the Conjoint Conference of Public Utility Associations in consultation and with the approval of the Mines Department had set up (a) a Central Advisory Coal Committee and (b) District Advisory Coal Committees to deal with questions arising during the war. The personnel of these Committees were reported.

Conjoint Conference of Public Utility Associations

A meeting of the Council held on July 12, was reported, the matters dealt with being as follows.

Mains and Cables in Highways.—A report was received from the Mains and Cables Committee with regard to the recommendations of the Joint Committee of both Houses of Parliament.

Pedestrian Subways.—Consideration was given to the question of pedestrian subways and the interference with works of Public Utility Undertakers and it was reported that the Ministry of Transport had been interviewed with regard to the position.

Finance Bill—Armaments Profits Duty.—The steps taken to exempt gas, water, electricity and hydraulic power undertakings from this measure were reported.

Parliamentary Special Orders under Section 10 of Gas Regulation Act, 1920.—It was reported that the Director of Gas Administration had drawn attention to the extreme difficulty of Special Orders being passed through Parliament at the present time owing to the great pressure caused by war work.

Income Tax—expenditure incurred in connexion with Public Lighting Services.—The negotiations between the Income Tax Committee of the Council and the Inland Revenue were reported with regard to various income tax questions particularly that relating to the question of the annual wear and tear and renewal allowance in respect of public lighting.

Royal Sanitary Institute—Health Congress, Scarborough, July 3-8, 1939.—A report from Mr. A. F. Yates, M.Inst.Gas.E., Engineer and Manager of the Borough of Goole Gas and Water Department, who attended this Congress as a delegate of the National Gas Council, was reported. A vote of thanks was passed to Mr. Yates for his excellent report and Mr. E. Crowther, Chief Engineer of the Newcastle-upon-Tyne and Gateshead Gas Company, for his speech on coal smoke abatement on that occasion.

British Gas Federation

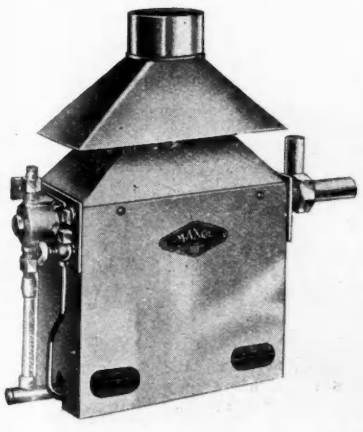
The following representatives were nominated to serve on the Council of the British Gas Federation for the year 1940:

Sir David Milne-Watson, Bart., M.A., LL.D., D.L.
Mr. Wm. Cash, F.C.A., J.P.
Mr. T. P. Ridley, F.C.I.S.
Mr. C. S. Shapley, M.I.Mech.E.
Mr. A. W. Smith, F.C.I.S.

A.R.P. Notes

Water Heating for A.R.P.

A new A.R.P. water heating unit manufactured in two sizes, of 30 and 100 gall. capacity respectively, has been designed and produced by Maxol Heaters, Ltd., Manchester. Intended for all-purpose equipment, the unit includes a ball tank for the cold water supply, storage cylinder, circulator, and the necessary connecting fittments and tubes up to and including a union and tail on the "draw off" side. The circulator is composed of two copper tubes to which the heat exchangers are attached, and which are brazed into the gunmetal end brackets. The main gas supply is controlled by a bi-metal safety device and the tank temperature is regulated by an easily controlled thermostat. A feature that renders the unit especially suitable for A.R.P. work is that an additional emergency draw off connexion from the base of the tank ensures the full amount of hot water being available even though the gas and water connexions may have become severed or damaged. Adequate supplies for the showers, &c., necessary for decontamination squads are thus ensured at critical times between the fracturing of mains and the execution of repairs.



Asbestos Fire Safeguards

Precautions for the protection of personnel, plant, and equipment, necessitated by the outbreak of hostilities, are helpfully summarised in a folder issued to A.R.P. officers by Bell's Asbestos and Engineering, Ltd., of Bestobell Works, Slough. All the asbestos products described in the folder are the result of five years' practical and hazardous test, and experience with many users and with all Government Departments. Often special conditions require special treatment and equipment regarding which the Company's trained staff can advise and give reliable information as to the limits of the protection which can be given as well as the extent of the security which can be provided by asbestos in forms designed to provide protection at the lowest price compatible with safety. The equipment described in the folder comprises asbestos clothing (including the type of fire-fighting suits supplied to the Gas Light and Coke Company), blankets, screens, bomb snuffers, millboards, paper and cloth, as well as first aid outfits. Other products are a blacking out distemper for exterior and interior use, and bitumen camouflage paints, which are available in 15 colours.

RADIATION RESEARCH LABORATORIES CENTRALIZED at BIRMINGHAM

The rapidly increasing scope and activities of the Radiation Research Laboratories has led to the recent transfer of the remaining members of the London Research Staff to the new and enlarged Laboratories erected two years ago at Aston, Birmingham. In the following article we give an illustrated description of these extensive new Headquarters where research work on behalf of the Industry will in future be carried on.

The formation of Radiation, Ltd., in 1919 led to a pooling of the resources of the amalgamating firms, and, among other advantages, to the co-ordination of their laboratory work. One of the first steps taken was to set up a Central Laboratory Organization. The extension of the activities of the section led to the equipment of a Central Research Department, and it will be remembered that on Oct. 1, 1925, the Laboratories at 15, Grosvenor Place, London, were opened by Sir David Milne-Watson. During the 14 years that have elapsed, the staff engaged in research work for the Radiation organization has grown very considerably. The Research Department has been most successful, and has made a permanent mark on the Industry. The results of some of the work which has been done by this section were briefly referred to in a brochure "Research and its Practical Application" which was issued earlier in the present year.

In 1937, new and enlarged Laboratories were erected in Birmingham, and, when they were designed, arrangements were made to permit of the housing of the whole of the Research, Development, and Drawing Office staffs in the one section. To-day, in view of the rapidly expanding scope of the work in hand, centralization is found to be more necessary than ever, and the decision has been taken to transfer the remaining members of the Radiation Research Staff from London to the Central Laboratory at Radiation House, Aston, Birmingham. This move will be appreciated by the Industry, in the confident anticipation that it will lead to still greater activity of the Radiation Technical Section. The transfer was completed on Sept. 15, and all communications should now be sent to the Birmingham Address.

THE CENTRAL LABORATORIES AT ASTON

THESE extensive Laboratories, which are exceptionally well equipped, have obviously been planned with careful thought and a specialized knowledge of the facilities required. They are located on the fourth floor of Radiation House, Aston. In addition to the Laboratories themselves, there is situated on this floor a well-planned Central Drawing Office, a library and the administrative offices of the Technical Section.

Each Laboratory has white-tiled walls, specially selected floorings, concealed but accessible service supplies, and specially designed bench equipment. The gas and air compressors are housed in a separate room at the top of the building, and arranged to be operated by remote controls in the main Laboratory. The window space is particularly extensive, ensuring light and airy working conditions in each section. Thought has been given to the colour scheme, which is cream and black throughout the department.

General Laboratory

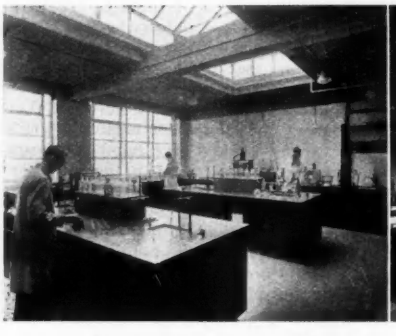
This roomy Laboratory is devoted to general experimental work on all types of the Company's products. The bench equipment has been specially designed to withstand heavy use. Each bench is provided with sinks with water services, high and low pressure gas, compressed air and power points, and the arrangement of the gas supplies follows a scheme whereby high or low pressure gas may be utilized from the same connexion.

Accurate meters are essential, and to facilitate the use and care of such equipment, complete units comprising meter, governor, and pressure gauge are provided on movable trucks which may be readily manœuvred into position, and effectively braked by the depression of a foot pedal. With this arrangement is associated a quick coupling system with wing union fittings, and reinforced flexible tubing.

The chemical and physical apparatus required for this Laboratory has in the main been specially designed, although it incorporates much standard equipment. Special apparatus has been developed for the measurement of temperature in the form of multi-point galvanometers and thread recorders. Portable gas analysis equipment is also available, together with the necessary apparatus for preparing gases of a wide range of compositions.

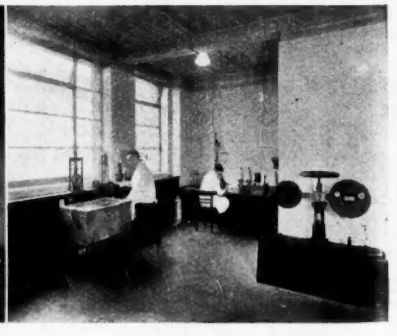
Chemical Laboratory

This Laboratory has been planned to facilitate all types of analytical work. The bench equipment is provided with the usual services of gas, water, compressed air, and electric current.



Chemical Laboratory

Central Drawing Office



Metallurgical Laboratory

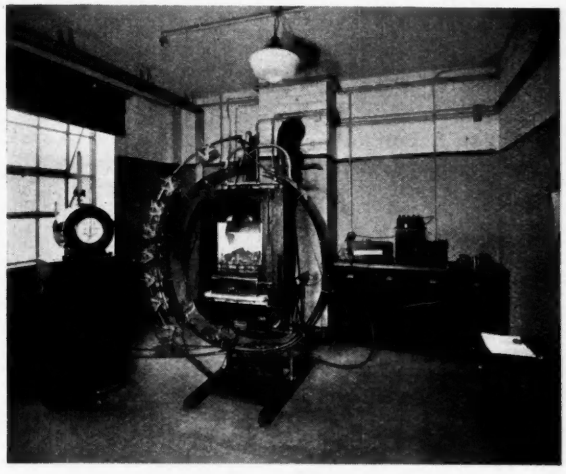
Fume cupboards, titration tables, and glass-fronted cases for reagents and apparatus are also provided.

All the necessary equipment is available for every type of analytical work associated with technical development and works control. An important part of this work is that associated with the analyses and control of foundry materials such as pig iron, coke, limestone, sand, and slag, which are so important for the successful manufacture of castings suitable for the enamelling treatment subsequently applied.

Among the permanently set up apparatus may be mentioned the equipment for the determination of carbon by combustion, pH values water analyses and electro-chemical analyses.

Physical Laboratory

This is devoted to the development of all types of space heating appliances, though the major part of its resources is applied to



Solid Fuel Laboratory—Radiometer Room

radiant heaters. For instance, the designing of a new radiant heating appliance involves examination in respect of combustion, radiant efficiency, and surface temperature, the distribution and quality of radiation, and the influence of chimney pull on its performance. Specialized and extensive equipment is required for such work.

The most highly developed piece of equipment is the integrating radiometer, which enables the radiation output of a heater to be determined in a few minutes. The apparatus was described by Bennett and Hartley in a Communication presented to the Institution of Gas Engineers in November, 1936, and represents the latest advance in the determination of the heat emission of a radiant source, the importance of which was first recognized by the Gas Industry.

Equipment has been developed for the measurement of the total heat in combustion products and involves specially designed sampling devices and resistance thermometers. Thermo-couples operating in conjunction with galvanometers are employed for the measurement of surface temperatures.

The principal factor determining the quality of radiant energy from the point of view of comfort is its wave length, an object of gas fire development being to produce as great a proportion as possible of those wave lengths which are capable of penetrating the human skin. To facilitate this work, a spectrometer is employed, the kernel of the instrument being a prism of pure rock salt which is continually warmed when in use to prevent damage to its optical qualities by moisture in the atmosphere. A sensitive thermopile enclosed in a vacuum jacket is made to traverse the heat spectrum formed by the prism, the heat intensity corresponding to any given wave length being indicated on a sensitive galvanometer.

A special apparatus has been developed in the Laboratories for the measurement of the penetration of radiation through human skin, clothing, &c. To avoid complication due to heating of the material under test, a very short, accurately timed "snapshot" exposure is given, and the response is measured on a ballistic galvanometer. The variable moisture content of the skin has been found to affect the results, and for this reason screens of horn and bakelite are frequently used as substitutes when the quality of radiation from different sources is being compared.

Another important feature of the work in this section of the Laboratory is the determination of flame characteristics, involving the rapid measurement of air-gas ratios, flame speeds, and temperatures.

Metallurgical Laboratory and Dark Room

This laboratory is concerned mainly with problems arising in the foundries, and in particular with those associated with the production of a cast iron suitable for enamelling.

Full equipment is available for the examination of specimens, including microscope and camera. The cause of enamelling defects has frequently been brought to light by the use of this equipment, in addition to the exploration of problems connected with electro-plating and the condition of metals generally.

An X-ray installation is also provided for the diffraction analysis of materials. This has been used principally in enamel research for such work as the investigation of changes occurring during the manufacture of frits, and the subsequent fusion of the enamel on to the article. Variations in both the physical and chemical characteristics of the material can be readily detected. The identification of small quantities of unknown substances, such as corrosion products, the determination of homogeneity, and crystalline condition are also readily effected with this equipment.

Apparatus for the rapid estimation of moisture in foundry sands is available, together with equipment for determining strength and permeability. Grain size is determined by employing mechanical sieves or an elutriator, by means of which all particle sizes and bonding material can be readily determined.

A salt-spray cabinet is another important feature of the equipment, enabling electro-plated and other coated components to be tested for resistance to corrosion. In addition to the examination of particular specimens, regular examination of components from current production are always on test.

Direct measurement of the thickness of coatings on iron and steel is made with another type of instrument, specially developed by the Central Research Laboratory staff, a number of which are in constant use for checking enamelled components.

Gas Analysis and Calorimetry Laboratory

An important section of the Laboratory is that devoted to gas analysis and calorimetry. The work of Radiation, Ltd., in developing a reliable method for the estimation of small quantities of CO is well known, and the latest improvements in this field are incorporated in the apparatus installed in the Laboratory. Standard equipment for making gas and air analyses, such as the Bone and Newitt and the Haldane apparatus, are also provided. The use of such apparatus has made possible the adoption of rigid combustion standards for all gas burning appliances such

General Laboratory

as were first advocated by Radiation, Ltd. The importance of this to the industry is now generally realized.

A Boys calorimeter is in constant operation for determining the calorific value of the gas supplied to all sections of the Laboratories.

Experimental and Demonstration Kitchens

Associated with these Laboratories, well equipped kitchens are maintained. For the training and general use of demonstrators, a comprehensive range of Radiation cooking appliances is available, together with supplies of all types of cooking utensils. These kitchens operate in conjunction with the Home Service Section, and are capable of dealing with training classes of twenty-five demonstrators simultaneously.

Working in close collaboration with the kitchen is a Laboratory equipped for all types of cooking tests on new appliances, and for

the prosecution of more fundamental research into the physics and chemistry of cooking processes.

Solid Fuel Laboratory

This section of the Laboratory organization is concerned primarily with the development of appliances for burning coke, and, as in the case of the Laboratories dealing with the development of gas-burning appliances, is equipped with apparatus for exhaustively dealing with all problems in this branch of business.

Comprehensive testing equipment is available for complete examination of solid fuels, covering calorific value and analysis, in addition to the special equipment required for grading cokes and carrying out shatter tests, critical air blast, and reactivity determinations.

For development work on appliances, special settings are provided at numerous points in the Laboratory incorporating fans, draught gauges, and flow meters for the measurement of combustion products, together with temperature measuring equipment, all connected to an instrument panel where direct readings can be made and recorded.

Owing to the rapid changes in heat output of a solid fuel fire, a modification of the Integrating radiometer already described in connection with gas fire development has been devised. This was discussed by Davidson and Hartley in I.G.E. Communication 200/83, and is so arranged that the total radiation from the source can be determined in a period of less than two minutes.

Enamelling Research Laboratory

Associated with the Main Laboratories, but in a separate building, is a section devoted to the study of vitreous enamelling. It is equipped for chemical and physical investigations in connexion with vitreous enamels and allied subjects, in addition to incorporating semi-production scale plant for larger trials under practical conditions.

Enamel frits are developed in this section, and among the equipment in use may be mentioned the following, which gives some indication of the scope of the work carried out:

Elutriator for studies of particle size distribution in milled enamels.
Apparatus for determinations of viscosity and surface tension of molten enamel frits.
Magnetic thickness gauge for determining the thickness of vitreous enamel applied on cast iron or steel.
Torsion viscometer for measurement of viscosity and thixotropy of suspensions and emulsions.
Polarizing microscope.
Electrometer valve pH meter, with electrode systems for determinations of hydrogen ion concentrations.
Pyrometers, including rare and base metal couples, radiation and optical types.

Every enamel developed is put through exhaustive trials before introduction to the works, and each one is examined for working properties, opacity, gloss, impact strength, resistance to bending, thermal resistance, and acid resistance. The tests used have been developed in the Central Research Laboratories.

Close contact is maintained with the works in developing any new enamel to ensure that the fullest possible information is obtained before the material is finally adopted.

Production Laboratory

Adjacent to the Research Department is the Production Laboratory, which is equipped for routine control tests in the factory. All phases of processing are checked at frequent intervals both day and night throughout the working week. These include, grading of steel grit for shot-blasting, maintenance of solution concentrations in pickling, control of enamel smelting, and approval of frits for production use, examination of all batches of milled enamels, adjusting and maintaining enamel consistencies, and tests on finished ware to ensure that these are in accordance with specification.

THE PROVISIONS OF
The Fuel and Lighting Order

We publish below the full text of the Fuel and Lighting Order made by the Board of Trade on Sept. 2 under Regulation 55 of the Defence Regulations, 1939.

Whereas it appears to the Board of Trade to be necessary for maintaining supplies essential to the life of the community and expedient that this Order should be made:—

Now, therefore, the Board of Trade, in pursuance of Regulation 55 of the Defence Regulations, 1939 (a), hereby order as follows:

1. This Order shall apply to the following premises (hereinafter referred to as "controlled premises") that is to say,—

(*a*) any premises not used or appropriated wholly or mainly for industrial purposes, and

(*b*) any premises used or appropriated wholly or mainly for industrial purposes, other than premises for consumption in which the quantity of coal supplied in the standard year and the quantities of coal equivalent to the quantities of gas and electricity so supplied were together more than one hundred tons;

provided that if the Local Fuel Overseer, on the application of the occupier thereof, is satisfied that it is inexpedient that the supply of coal, gas and electricity to any controlled premises used or appropriated wholly or mainly for industrial purposes should be regulated by this Order, he may, with the consent of the Divisional Coal Officer, issue to the occupier a certificate to that effect and this Order shall cease to apply to those premises as from the date of the certificate.

Regulation of the Acquisition and Supply of Coal for Controlled Premises

2.—(1) In any quarter the quantity of coal acquired or supplied for consumption in any controlled premises shall not exceed—

(*a*) where 75 per cent. of the sum of the basic quantities of coal in respect of those premises for the four quarters of a year exceeds two tons, 75 per cent. of the basic quantity for that quarter (fractions of a hundredweight being treated as a hundredweight); or

(*b*) in any other case, in respect of the quarters ending on the 31st March, 30th June, 30th September and 31st December, in any year subject to the following provisions of this Article, thirteen hundredweights, seven hundredweights, seven hundredweights and thirteen hundredweights respectively.

(2) The basic quantity of coal in respect of any premises for any quarter shall be—

(*a*) the quantity of coal fixed by any notice issued by the Local Fuel Overseer in respect of those premises for that quarter by virtue of the following provisions of this Order, or

(*b*) where no such notice has been issued, the quantity of coal acquired during the corresponding period during the standard year for consumption in those premises.

(3) The Local Fuel Overseer may, on the application of the occupier of any controlled premises, being premises to which the quantity of coal supplied in any quarter is regulated by sub-paragraph (*b*) of paragraph (1) of this Article, by notice in writing vary with respect to those premises the quantities specified in that sub-paragraph in relation to the respective quarters, so, however, that the quantities as varied shall amount in the aggregate to two tons.

3.—(1) Subject to the provisions of Article 5 this Article does not apply to controlled premises to which the quantity of coal supplied during the standard year did not exceed two tons, and for which coal is normally supplied in quantities not exceeding one hundredweight at any one time.

(2) The occupier of any controlled premises, to which this Article applies and for which coal is required, shall send a request for the registration of those premises to the licensed merchant from whom he desires to obtain supplies of coal.

Subject to the provisions of paragraph (12) of this Article no person shall procure the registration of any premises with more than one merchant.

(3) A request for the registration of any premises shall be in writing, signed by the occupier of those premises, and shall state whether any coal was acquired by him during the standard year for consumption in those premises from any person other than the merchant to whom the request is sent, and if so, the name and address of that person and the quantity of coal

(a) S.R. & O. 1939, No. 927.

obtained from him in each period of the standard year corresponding to a quarter.

(4) Every licensed merchant shall keep a register in such form as the Local Fuel Overseer may direct showing, in relation to and premises for the registration of which he has received a request that complies with the foregoing provisions of this Article, the following particulars, that is to say:—

(*a*) the description of the premises,
(*b*) the name of the occupier thereof, and
(*c*) the basic quantity of coal in respect of those premises for each quarter.

(5) If a merchant cannot from his own records ascertain the quantity of coal supplied in each period of the standard year corresponding to a quarter to any premises registered by him (not being premises in respect of which the basic quantities of coal have been fixed by a notice issued by the Local Fuel Overseer), the determination of the basic quantities to be registered shall be referred to the Local Fuel Overseer.

(6) The Local Fuel Overseer may, if he thinks fit on the application of the occupier of any premises, by notice in writing authorise the removal of those premises from the register of one licensed merchant and the registration thereof with another licensed merchant. Any such notice shall state the particulars to be registered in respect of those premises by the last mentioned merchant.

(7) The occupier of any premises may require those premises to be removed from the register of one licensed merchant and registered with another licensed merchant on the 1st July in any year on giving to the Local Fuel Overseer and to those merchants not less than 21 days' previous notice in writing, stating the names and addresses of those merchants. The first mentioned merchant shall cancel the particulars registered by him under paragraph (4) of this Article in relation to those premises and shall send a copy of those particulars to the last mentioned merchant, who shall enter those particulars upon his register, and such cancellation and registration shall take effect on the 1st July in the year in which such notice was given.

(8) On entering any particulars relating to any premises upon his register, a merchant shall give notice thereof to the occupier of those premises, and if the occupier considers any entry to be incorrect, he may within 14 days of the date of the notice refer the matter to the Local Fuel Overseer or to the arbitration of a person appointed by the Divisional Coal Officer.

(9) The entry upon the register of basic quantities of coal in respect of any premises shall not be deemed to prevent the supply to those premises during a year by the licensed merchant of any greater quantities of coal permitted to be supplied by virtue of sub-paragraph (*b*) of paragraph (1) of Article 2.

(10) Except in accordance with a licence in writing issued by the Local Fuel Overseer, coal for consumption in any controlled premises to which this Article applies shall not during any quarter be acquired from or supplied by any person other than the licensed merchant with whom those premises are registered.

(11) No merchant shall during any quarter supply coal for consumption in any premises registered with him except in pursuance of an order therefor in writing signed by or on behalf of the occupier of those premises.

(12) Notwithstanding anything in paragraph (2) of this Article where the occupier of any controlled premises has during the standard year obtained coke from a licensed merchant being gas undertakers or other persons producing coke, he may, after giving notice in writing to the Local Fuel Overseer of his intention, register those premises with that merchant in addition to any registration with another licensed merchant, and in that case Article 2 and this Article shall have effect subject to the following modifications:—

(*a*) the quantity of coke obtained in the standard year from the first mentioned merchant shall not be taken into account in determining any basic quantity of coal to be registered by the last mentioned merchant;
(*b*) in determining any basic quantity to be registered by the first mentioned merchant no account shall be taken of any coal obtained in the standard year from any other person, and
(*c*) the quantity of coal acquired from or supplied by either merchant in any quarter for consumption in those premises shall not exceed 75 per cent. of the basic quantity registered by him for that quarter (fractions of a hundredweight being treated as a hundredweight).

4.—(1) Subject to the provisions of Article 5, this Article applies only to controlled premises, to which the quantity of coal supplied during the standard year did not exceed two tons, and for which coal is normally supplied in quantities not exceeding one hundredweight at any one time.

(2) If the Local Fuel Overseer is satisfied that any premises are premises to which this Article applies he shall on the application of the occupier thereof issue to him a certificate to that effect.

(3) A licensed merchant upon supplying coal during any quarter for consumption in any premises to which this Article applies shall enter upon the certificate relating to those premises his name, the date, and the quantity of coal supplied; provided that this paragraph shall not apply to a sale of not more than twenty-eight pounds of coal if the coal is delivered to the purchaser at premises in the occupation of the merchant and conveyed therefrom by the purchaser.

5.—(1) If the Local Fuel Overseer is satisfied in view of the reasonable requirements for coal—

(*a*) in any controlled premises to which Article 4 applies, that basic quantities of coal should be fixed in respect of those premises, or
(*b*) in any controlled premises to which Article 3 applies, that the basic quantities of coal registered by a licensed merchant in respect of those premises should be amended,

he may, by notice in writing, fix or amend the basic quantity in respect of those premises for each quarter.

(2) Article 3 shall apply to any premises in respect of which such a notice has been issued, and any certificate issued under Article 4 in respect thereof shall become void and be sent forthwith to the Local Fuel Overseer by the occupier of the premises.

(3) Any notice issued under this Article shall be sent to the occupier of the premises to which it relates and, in the case of premises registered with a licensed merchant, a copy thereof shall be sent to that merchant.

Register of Licensed Coal Merchants

6.—(1) The Local Fuel Overseer shall keep a register wherein shall be entered the name of every person permitted to supply coal retail in the district for consumption in any controlled premises, together with the address of each office, wharf, depot or other premises from which that person carries on business in that district. Any person whose name is so entered is in relation to that district in this Order referred to as a "licensed merchant."

(2) The Local Fuel Overseer shall, on application therefor made in such form and manner as he may require, enter on that register the name of any person who has during the period of six months immediately preceding the date on which this Order comes into force carried on the business of selling coal retail in the district, and may if he thinks fit register any other person who desires to carry on such a business.

(3) Any person aggrieved by a refusal of the Local Fuel Overseer to register him may appeal to the Divisional Coal Officer.

(4) After the expiration of 14 days from the date on which this Order comes into force no person other than a licensed merchant may supply coal retail in any district for consumption in any controlled premises:

Provided that where the occupier of any such premises is removing therefrom he may dispose of any coal thereat to the incoming occupier, or to such other person as the Local Fuel Overseer may approve.

7.—(1) Upon entering the name of any person upon the register of licensed merchants the Local Fuel Overseer shall issue a certificate of registration to him.

(2) Every licensed merchant shall prominently display the certificate issued to him or a copy thereof in each office, depot or other premises from which he carries on the business of selling coal retail in the district.

8.—For the purpose of securing that supplies of coal shall be equitably distributed throughout the district, the Local Fuel Overseer may give directions to any licensed merchant—

(*a*) regulating the quantity of coal which may be supplied to any controlled premises at any one time; or
(*b*) regulating the rotation in which orders for coal may be executed;

and any merchant to whom such directions are given shall comply therewith.

9.—(1) The foregoing provisions of this Order shall not apply to the supply of coal to, or the acquisition of coal by, miners or other regular workers employed at or in connection with collieries or the dependants of such miners or workers, being coal supplied or acquired either free or at a nominal or reduced price in accordance with any arrangement or practice existing at the date of this Order.

(2) Any person so supplying coal shall make a return, at such times as may be determined by the Divisional Coal Officer, to the Local Fuel Overseer of the district in which any miner, worker or dependant resides, of any quantity of coal supplied to such person by virtue of this Article.

Regulation of the Consumption of Gas and Electricity

10.—(1) There shall not be consumed in any controlled premises in any quarter a quantity of gas or electricity supplied by undertakers exceeding—

(*a*) if basic quantities of gas or electricity, as the case may be, are fixed for those premises by the notice sent to the occupier thereof by the undertakers under the next following Article, 75 per cent. of the basic quantity so fixed for that quarter ; or

(*b*) in any other case, the primary quantity so fixed for that quarter.

(2) This Order shall not apply to the consumption of electricity in controlled premises in which a supply of electricity cannot be obtained except upon prepayment therefor by means of a meter adjusted in relation to the amount of energy obtained by reference to the charge made for purposes of lighting to ordinary consumers who do not also pay a periodical fixed or service charge.

11.—(1) All undertakers shall, within 28 days after the date on which this Order comes into force, send to the occupier of each of the controlled premises supplied by them a notice in writing stating in relation to the supply of gas or electricity, as the case may be, to those premises—

(*a*) the periods in each year which shall be quarters for the purposes of this Order, and

(*b*) where 75 per cent. of the sum of the basic quantities of gas or electricity, as the case may be, in respect of those premises for four consecutive quarters exceeds the sum of the primary quantities thereof for those quarters, the basic quantity of gas or electricity, as the case may be, for each quarter, or

(*c*) in any other case, the primary quantity of gas or electricity, as the case may be, for each quarter.

(2) The quarters fixed under the last preceding paragraph shall be of approximately thirteen weeks each, and each shall, if possible, begin on a date on which the meter measuring the consumption of gas or electricity, as the case may be, in those premises was read during the standard year.

(3) The basic quantity for any quarter shall be the quantity of gas or electricity, as the case may be, consumed in those premises in the corresponding period in the standard year.

(4) The primary quantity of gas for the quarter commencing next after the 28th February in any year shall be 20 therms and for the succeeding quarters 20 therms, 30 therms and 30 therms respectively ; provided that where gas is supplied by undertakers who are not authorised to charge therefore according to the number of British Thermal Units supplied, this paragraph shall have effect with the substitution of 200 cubic feet for each therm.

(5) The primary quantity of electricity for the quarter commencing next after the 28th February in any year shall be—

(*a*) in the case of premises in which there is not on the date on which this Order comes into force any range or stove consuming coal or gas and designed or adapted for cooking, 200 Board of Trade Units, and for the succeeding quarters, 200 Board of Trade Units, 300 Board of Trade Units and 300 Board of Trade Units respectively, or

(*b*) in any other case, 34 Board of Trade Units, and for the succeeding quarters, 34 Board of Trade Units, 66 Board of Trade Units and 66 Board of Trade Units respectively.

(6) The Local Fuel Overseer shall, if satisfied, on the reference of the matter to him either by the occupier thereof or by the undertakers that any controlled premises are such premises as are described in sub-paragraph (*a*) of the last preceding paragraph, give notice in writing to the undertakers of that fact, but the primary quantities specified in that sub-paragraph shall not be stated in any notice sent by undertakers under paragraph (1) of this Article unless the Local Fuel Overseer has given such notice as is first mentioned in this paragraph in relation to those premises.

(7) If the occupier of any controlled premises considers that any notice relating to those premises sent under this Article is incorrect, he may within 14 days of the date of the notice refer the matter to the Local Fuel Overseer or to the arbitration of a person appointed by the Divisional Coal Officer.

(8) In relation to any premises to which during the standard year or a part thereof gas or electricity, as the case may be, was not supplied, but to which a supply is given at the date on which this Order comes into force or at any time thereafter, this Article shall have effect with the following modifications:—

(*a*) quarters shall be periods of approximately 13 weeks each, beginning on the dates on which the undertakers propose to read the meter,

(*b*) the said notice shall state the primary quantity for each quarter ; so however that the Local Fuel Overseer may by notice in writing direct that the notice shall state such basic quantity for each quarter as he thinks appropriate, and

(*c*) where the supply is first given after the date on which this Order comes into force, reference to that date shall be read as reference to the date upon which the supply is first given.

12.—(1) If at any time after the date on which this Order comes into force any range or stove consuming coal or gas and designed or adapted for cooking is installed in any controlled premises, being premises in relation to which a notice has been sent by the undertakers under the last preceding Article stating such primary quantities of electricity as are specified in sub-paragraph (*a*) of paragraph (5) of that Article, the occupier of those premises shall forthwith give notice in writing thereof to the Local Fuel Overseer and to the undertakers, and the said notice sent by the undertakers shall have effect as if the primary quantities of electricity specified in sub-paragraph (*b*) of that paragraph were stated therein.

(2) The Local Fuel Overseer shall, if satisfied at any time after the date on which this Order comes into force on the application of the occupier of any controlled premises—

(*a*) that there is not at that time in those premises any range or stove consuming coal or gas and designed or adapted for cooking, and

(*b*) that if there had been no such range or stove in those premises at the date on which this Order came into force, a notice sent by the undertakers under the last preceding Article in relation to those premises would have stated such primary quantities of electricity as are specified in sub-paragraph (*a*) of paragraph (5) of that Article,

give notice thereof to the undertakers and the said notice sent by the undertakers shall have effect as if the primary quantities of electricity so specified were stated therein.

13.—(1) If the Local Fuel Overseer is satisfied, in view of the reasonable requirements for gas or electricity in any controlled premises—

(*a*) that basic quantities of gas or electricity should be fixed in respect of those premises, or

(*b*) that the basic quantities thereof should be amended,

he may, by notice in writing, fix or amend the basic quantity in respect of those premises for each quarter ; so however that no basic quantities shall be fixed such that 75 per cent. of the sum of them for four consecutive quarters is less than the sum of the primary quantities in relation to those premises.

(2) The Local Fuel Overseer may at any time on the application of the occupier of any controlled premises vary by notice in writing any primary quantities of gas or electricity fixed in relation to those premises, but so that the sum of them for four consecutive quarters shall not be altered.

(3) Any such notice shall be sent to the occupier of the premises and a copy thereof shall be sent to the undertakers, and any notice sent by the undertakers to those premises shall have effect as if it were amended accordingly.

14.—(1) Where the quantity of gas or electricity consumed in any quarter in any controlled premises exceeds the quantity permitted to be consumed therein, the undertakers shall give notice thereof to the Local Fuel Overseer.

(2) The Local Fuel Overseer may by notice in writing direct that the supply of gas or electricity, as the case may be, to those premises shall be disconnected for such period as may be specified in the notice, and the undertakers shall carry out such directions.

The Local Fuel Overseer in determining the period during which the supply is to be disconnected shall have regard to the extent to which the quantity permitted to be consumed in that quarter has been exceeded.

(3) Undertakers may for the purpose of this Article enter upon the premises and the costs incurred in connection with the disconnection or reconnection of any supply shall be borne by the occupier of those premises.

(4) Any action taken under this Article shall be without prejudice to any proceedings which may be taken against any person in respect of any breach of the provisions of this Order.

15.—Where the meter measuring the gas or electricity consumed in any premises has not been read by the undertakers at the beginning and end of any quarter or period during the standard year corresponding thereto, the quantity of gas or electricity, as the case may be, consumed in that quarter in those premises shall for the purposes of this Order be deemed to be a quantity calculated on the assumption that the consumption on each day between the dates of two consecutive readings of the meter was the same.

Local Fuel Overseers

16.—(1) Each local authority shall within seven days after the date on which this Order comes into force appoint for their district an officer to be called "the Local Fuel Overseer" who shall hold office, subject to any directions of the Divisional Coal Officer, at the pleasure of the local authority.

Provided that arrangements may be made with the assent of the Divisional Coal Officer, and shall be made if he so directs, for a Local Fuel Overseer to be appointed for the districts of two or more local authorities, or for two or more Local Fuel

Overseers to be appointed by one local authority and for the allotment of a district to each of them.

In relation to a Local Fuel Overseer "local authority" in this Order means the local authority or local authorities by which he was appointed.

(2) No Local Fuel Overseer shall be interested directly or indirectly in the supply or distribution of coal, gas or electricity.

17.—(1) An Advisory Committee representative of persons supplying coal, gas and electricity in the district shall be appointed to assist each Local Fuel Overseer by the local authority, after consultation with any undertakers supplying gas or electricity therein and with any body appearing to the local authority to be representative of the interests of persons supplying coal therein, and that Committee shall advise the Local Fuel Overseer on any matters referred to them by him.

(2) The Advisory Committee for any district in which any registered industrial or provident society or societies is or are carrying on the business of distributing coal shall include a representative of that society or those societies.

18.—(1) The local authority shall provide for the Local Fuel Overseer such office, officers and servants as may be necessary for the performance of his duties under this Order.

(2) The office of the Local Fuel Overseer shall be open during the usual business hours of offices in the district and public notice shall be given of its situation and the times during which it is open.

19.—(1) The Local Fuel Overseer for each district shall have the functions entrusted to him by this Order and shall comply with all instructions of the Secretary for Mines and the Divisional Coal Officer in the exercise of any discretion or power conferred thereby.

(2) Subject to the last preceding paragraph the local authority may make arrangements for the supervision and control of the Local Fuel Overseer and the expenditure incurred by him.

(3) Any person aggrieved by any Act or decision of a Local Fuel Overseer may refer the matter to the Divisional Coal Officer, who shall give such instructions in relation thereto as he shall think proper.

20.—Any expenses incurred by a local authority in the execution of their powers under this Order shall be defrayed in the case of the Common Council of the City of London out of the general rate of the City of London and in the case of the Council of the Isles of Scilly out of the general fund of the Council.

Returns, Information and Inspection

21.—The occupier of any controlled premises shall give such information and particulars with regard to those premises, and with regard to any stocks of coal thereat, and to any coal, gas or electricity supplied thereto, as the Local Fuel Overseer may require for the purposes of this Order, and shall afford all assistance required by the Local Fuel Overseer to enable any particulars of information so given to be checked or verified, and shall permit the inspection of those premises and of any stocks of coal thereat by the Local Fuel Overseer or any person authorised in writing by him in that behalf.

22.—(1) Every licensed merchant shall keep a record in a form approved by the Local Fuel Overseer of all coal supplied by him to any controlled premises in the district.

(2) All records, books, accounts, orders for coal, receipts and vouchers relating to the supply of coal by any licensed merchant to any controlled premises in any district shall be open for inspection by the Divisional Coal Officer, the Local Fuel Overseer, or any person authorised in writing in that behalf by either of them, not being a person interested directly or indirectly in the supply or distribution of coal, gas or electricity in the district.

(3) A licensed merchant shall make such returns and reports relating to the supply of coal to any controlled premises in the district as may reasonably be required by the Local Fuel Overseer.

23.—(1) All undertakers shall keep a record in a form approved by the Divisional Coal Officer of the gas or electricity, as the case may be, supplied to any controlled premises.

(2) All records, books and accounts of undertakers, in so far as they relate to the supply of gas or electricity to any controlled premises in any district, shall be open for inspection by the Divisional Coal Officer, the Local Fuel Overseer, or any person authorised in writing in that behalf by either of them:

Provided that no such records, books or accounts, in so far as they relate to charges made for gas or electricity supplied as aforesaid, shall be open for inspection by the Local Fuel Overseer, or any person authorised by him, unless such inspection is authorised by the Divisional Coal Officer.

24. The Local Fuel Overseer shall keep such records and make such returns from time to time as the Secretary for Mines and the Divisional Coal Officer may determine.

25.—(1) In this Order, unless the context otherwise requires, the following expressions have the meanings hereby respectively assigned to them, that is to say:—

"Coal" includes bituminous coal, cannel coal, anthracite, coke and any manufactured fuel of which coal, anthracite or coke is the principal constituent;

"District" means a district for which a Local Fuel Overseer is appointed;

"Divisional Coal Officer" in relation to any district or premises means the Divisional Coal Officer for the time being appointed by the Board of Trade for the division in which that district is or those premises are situate;

"Licensed merchant" has the meaning assigned to it in Article 6;

"Local Authority" means—

(*a*) as respects England and Wales, the council of a county borough or county district, the common council of the City of London, the council of a metropolitan borough or the council of the Isles of Scilly; and

(*b*) as respects Scotland, a county or town council;

"Local Fuel Overseer" in relation to any premises, means the Local Fuel Overseer for the district in which those premises are situate;

"Premises" in relation to coal, gas or electricity, means any building or part of a building to which a separate supply of coal, gas or electricity, as the case may be, is normally given by a merchant or by undertakers; and "controlled premises" has the meaning assigned to it by Article 1;

"Quarter" means—

(*a*) in relation to coal, a period of three months ending on 31st March, 30th June, 30th September or 31st December in any year; and

(*b*) in relation to gas or electricity supplied to any premises, a period specified in a notice sent to those premises by the undertakers under Article 11; being a period commencing after the date on which this Order comes into force;

"Standard year" means—

(*a*) in relation to coal, a period of twelve months ending on the 30th June, 1939; and

(*b*) in relation to gas or electricity supplied to any premises, a period of twelve months during the years 1938 and 1939 ending on the date next before 30th June which constitutes the end of a quarter in relation to those premises.

"Undertakers" means persons who are engaged in supplying gas or electricity to the public.

(2) For the purpose of paragraph (b) of Article 1 of this Order the quantities of gas and electricity equivalent to one ton of coal shall be taken to be one hundred therms in the form of gas and one thousand four hundred Board of Trade units of electricity respectively; provided that where gas is supplied by undertakers who are not authorised to charge for gas according to the number of British Thermal Units supplied the quantity of gas equivalent to 1 ton of coal shall be deemed to be twenty thousand cubic feet.

26.—(1) This Order shall not extend to Northern Ireland.

(2) This Order shall come into force on the 7th day of September, 1939, and may be cited as the Fuel and Lighting Order, 1939.

A New "Portcullis" Catalogue

The term "catalogue" often carries with it the idea of a somewhat dull and relatively uninteresting publication devoted exclusively to lists and specifications of products. Such a description, however, can in no sense be applied to the latest production of Bratt Colbran, Ltd., of 10, Mortimer Street, W.1 (Catalogue No. 69). This is an excellently produced booklet containing a large number of delightful photographic illustrations reproduced in natural colours.

The "Portcullis" range of gas fires is now firmly established in the Industry by reason of the high standard that has been set as regards both design and efficiency. As we have remarked on previous occasions with reference to this firm's appliances, Bratt Colbran, Ltd., set out to make the gas fire not just an independent heating unit put in anywhere where an existing fireplace happens to be available, but rather to show the gas fire with appropriate surround and setting as one composite and complete whole. Thus they establish the gas fire in its proper perspective as a permanent and attractive part of the decorative scheme.

While several years of experience have served to emphasize its ever-increasing popularity, continual testing and research is carried out on the "Portcullis" radiant with the object of maintaining and where possible improving upon the standard of technical performance of the fire. The extended pattern radiant is now standard on all "Portcullis" flued fires of both the normal and high rated series.

In the pages of this catalogue Bratt Colbran, Ltd., present their latest series of gas fires portrayed in a selection of the many beautiful settings available, and a perusal of the pages leaves one with a definite appreciation of the Gas Industry's achievement from the æsthetic standpoint. In addition to full details of every fire and setting illustrated, a useful table of cubic capacities is included at the end of the publication.

D

A. R. P. Notes

DAMAGED MAINS AND THEIR REPAIR

There are a number of devices on the market whereby interruption in gas supply, due to damaged mains, can be quickly restored. One cannot generalize, but it appears from the many pamphlets which have come into the writer's hands that the majority of these devices achieve only a temporary repair, and even among these there is at least one which places a stricture in the main.

by

A. H. Burton,

(Assistant Engineer and Manager, Warrington Gas Department)

A STUDY of the subject leads to three conclusions—(1) the method of repair must be such as to achieve the object in the least possible time ; (2) the repair should be permanent ; and (3) no constriction should be placed in the main.

In considering No. 1, time can be saved by eliminating the squaring up of the broken ends preparatory to making a joint ; and to this end a range of special collars has been designed whereby the repair of any given main may be effected by using two of these collars and such length as may be necessary of the next suitable larger size. Thus, to repair a broken 9 in. main two special collars, 9 in. by 12 in., would be necessary, together with the appropriate length of 12 in.

The use of these special collars necessitates the removal of the socket, which, of course, would be done early as part of the A.R.P. scheme. Then, if the gap in the broken main is larger than the maximum available length of spigot-ended pipe (17 ft. 9 in.) an ordinary socket and spigot length is used plus a short plain length which may have any overall dimension provided it is long enough. Incidentally, there are usually some of these latter available on most works.

No Necessity to Cut Pipe

It will be readily appreciated there is no necessity to cut any of the pipes, as, should the available lengths of pipe which it is proposed to use for the repair be too long, it is only necessary to bare a further length of the main which has been damaged by extending the side of the crater and slide the special collar back far enough to permit a joint to be made.

Apart from any consideration of naphthalene deposits, this method deals with conclusions 2 and 3, as the repair is at once permanent and places no stricture in the main.

Simplicity of the Scheme

Reference to the sketch (Fig. 1) will reveal at once the simplicity of the scheme, and beyond remarking that the internal flange is there in the case of the smaller main simply as a stop for the yarn or the jointing material—no detailed explanation is necessary.

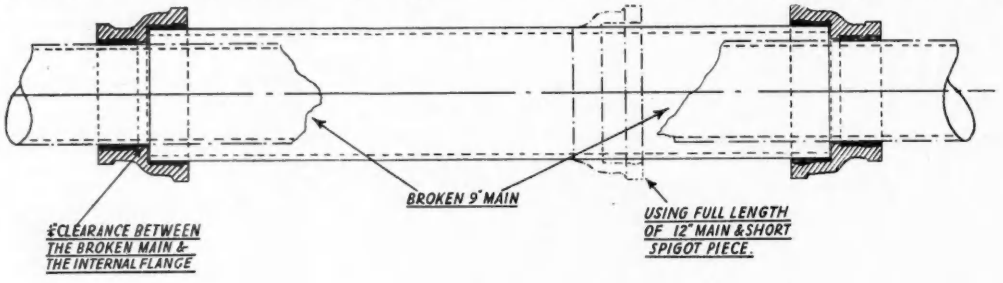


Fig. 1

Elimination of Drilling and Tapping

An additional means of time saving, coupled with permanency, is the elimination of drilling and tapping for bag holes.

This is accomplished by inserting a special pipe as a component part of the repair, the use of which permits the withdrawal of the cone stoppers after the main has been repaired. This casting is shown diagramatically in Fig. 2. The stoppers are withdrawn through the flanged openings and the covers jointed down in the usual manner.

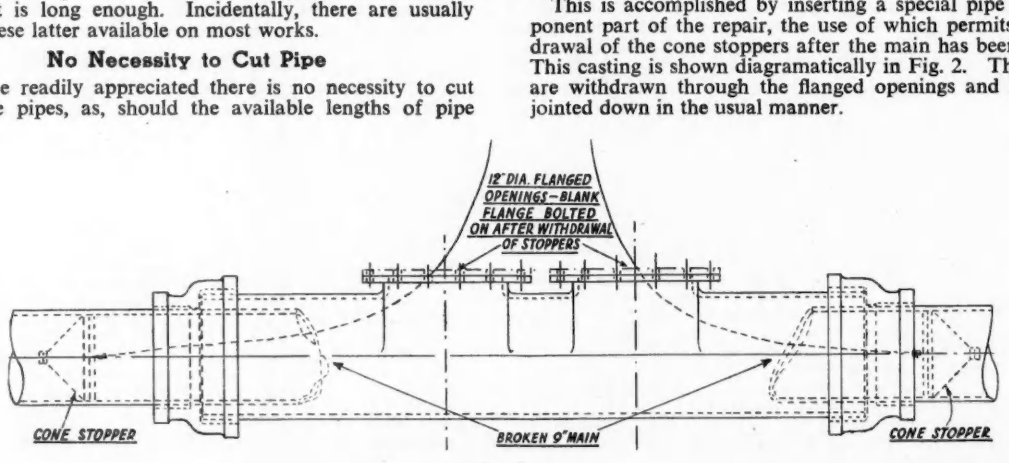


Fig. 2

Industrial Baking and Drying Operations

Presented before Midwest Industrial Gas Sales Council, Industrial Gas Section, American Gas Association

By JAMES E. DARE,

Public Service Company of Northern Illinois

INDUSTRIAL baking and drying processes offer a vast potential field for gas sales. The ever-increasing demand for higher quality products and production rates has done much in promoting the use of gas as the fuel.

In that we are all primarily interested in increasing gas sales, let us first consider the various types of industrial baking and drying operations where we might obtain new loads. The logical applications for gas may be listed as follows:

Baking.	Temperature Range, ° F.
1—Cores	300—500
2—Japan	250—400
3—Synthetic Enamels	250—400
4—Varnishes	250—400
5—Electric Coils and Armatures	250—350
6—Lithographing	250—350
7—Wire Coating	250—350

Drying.	Temperature Range ° F.
1—Moulds	250—350
2—Lumber	70—150
3—Fruits	70—100
4—Macaroni	110—150
5—Shoes	100—200
6—Textiles	100—180
7—Paper	100—200
8—Photographic Paper	90—110
9—Clothes	100—180
10—Chemicals	100—400
11—Sand	205—450
12—Hair	150—190
13—Rugs	120—180
14—Paint	250—350
15—Enamel	250—300
16—Eggs	200—280
17—Ladles	300—400

All these operations come within what is known as the low temperature field in process work, which usually indicates a temperature of 600° F. and under. The maximum temperatures that can be used without injuring the product as well as the proper temperature range are indicated.

Now let us consider how we are going to obtain this prospective business. When considering gas as a fuel for supplying the heat necessary in this field of industrial process work, the first and most apparent fact is that, aside from electricity, gas has the highest unit cost based on relative heat units. We also find coal, coke, steam, and oil in use as a heat source for these types of industrial operations. However, this apparent fact need not be a discouraging item to the industrial gas engineer, as evidenced by the fact that in most new oven installations gas is used as the fuel, and conversions of present ovens to gas are being made in all parts of the country.

The customer can either figure or already knows the heat unit comparison of the various fuels but he does not know how his particular baking or drying operation can be accomplished with gas as a fuel at a lower cost for the finished product and at the same time increase the quality of the work as well as decrease the actual time required for the baking or drying process. It is therefore the industrial gas engineer's problem to be able to obtain the customer's confidence and present a clear concise picture of the advantages offered through the use of gas.

This can only be accomplished through the industrial gas engineer's complete knowledge of the use and application of gas in this field of process work; this knowledge should include the following items:

1. Method of calculating heating requirements.
2. Gas-fired air heaters and complete ovens available on the market to-day.
3. All necessary data relative to the competitive fuels.
4. Methods of insulating present ovens to be converted to gas and importance of such insulation.
5. Insurance regulations against fire and explosions where volatile flammable thinners are to be removed.

It is the purpose in the balance of this Paper to present pertinent information relative to the items just mentioned through a discussion which will include theoretical, test and operating data. It might be well to mention that throughout this discussion it is assumed that drying and baking operations are accomplished through the process of convection of heat rather than radiation of heat.

Calculating Heating Requirements

The gas-fired air heater capacity is determined by the heat requirements of the job, which may be listed as follows:

1. Heat required for work including water or volatiles evaporated.
2. Heat loss from conveyor, trucks, racks, &c.
3. Heat loss from oven walls, roof, &c., and exposed ducts.
4. Heat absorbed by oven walls, roof, &c.
5. Heat loss for oven ventilation.

Type of Process.	Operating Temp. ° F.	Type of Heating System.	B.Th.U. Per Cu.Ft. Oven Volume.
Shoe Drying	150	Direct Fire Non-Recirculating	140
Paint Drying	180	Recirculating	220
Paint Baking	350	Direct Fire Recirculating	700
Core Baking	450	Direct Fire Non-Recirculating	800
Core Baking	450	Direct Fire Recirculating	600
Enamel Baking	350	Direct Fire Recirculating	800
Enamel Baking	350	Circulating	500
Core Baking	450	Direct Fire Line Burners	1,000

The method of calculating the first four items is not difficult due to standard formulæ, tables and graphs available for use. However, very little information is available on the method for calculating the heat loss for oven ventilation in a recirculating system. First we must consider whether water or volatile flammable thinners are to be removed. For a process where no volatile flammable thinners are evaporated the exhaust can be assumed to be equal to the input volume of gas plus the air required for combustion. For a process where volatile flammable thinners are evaporated one must exhaust approximately 3,300 cu.ft. to 9,000 cu.ft.* of heated air from the oven per gallon of thinner evaporated per unit of time. After the amount of air for ventilation has been determined the heat loss can be obtained through use of air heat content curves.

The total heating requirements and the operating temperature determine the volume of air to be heated. It is considered good practice to use the greatest number of air changes per hour at the lowest air temperature possible for any particular baking or drying process. This can be explained in that the greater the number of air changes, the greater the uniformity, and the faster the baking or drying operation can be performed as circulating warm air, which we call "convected heat," will transfer the heat faster to the material being processed in that the dead air film around this material is destroyed. In general, air heating applications in use to-day produce air-changes anywhere from 10 to 80 per hour.

The following practical data will help in checking the heater size as selected.

Gas-Fired Air Heaters and Ovens

There are at least nineteen manufacturers who are in a position to supply well-designed gas-fired air heaters and ovens, and there are at least two manufacturers who are able to supply well-designed dehumidifiers.

A detailed discussion of the design characteristics of all the various air heaters is not warranted due to their similarity. There are three main types of air heaters—namely:

1. Direct fired refractory combustion chamber.
2. Direct fired line burner.
3. Indirect fired radiator.

* Amount of air depends on efficiency of circulation and heat distribution.

In the first type gas is introduced through a low or high pressure inspirator, premix blower, or nozzle mixing burner into an inside refractory combustion chamber. This chamber allows rapid expansion during combustion resulting in high gas burner efficiencies, in that the flame is protected from the cooling effect of the recirculated air or cold inlet air in the case of a non-recirculating heater. After combustion is complete, the products are mixed with the fresh air and recirculated air under positive control. The heated air is then delivered to the heat distributing ducts which are properly arranged in the oven. This is accomplished through use of a circulating fan located at either the heater inlet or outlet. Air heaters can be obtained for either "push through" or "pull through" operation. "Push through" heaters should be selected where a large temperature rise through the heater and high discharge temperature is desired operating against small static back pressures. "Pull through" heaters should be selected where a small temperature rise through the heater and low discharge temperature is desired operating against high static back pressures. There are connexions for recirculated air and fresh air inlet with damper control on all of the heaters.

In the second type a gas mixture from a premix blower or high-pressure inspirator is delivered to a line burner or multiport burner which is enclosed in an insulated steel metal housing. The circulating fan draws the recirculated or fresh air around the line burner in a "pull through" type of heater and delivers the heated air to the oven duct work. The "push through" type of line burner air heater can also be obtained.

Safety Control

The first two types of air heaters can be obtained with full safety control equipment—namely:

1. Electric spark ignition.
2. Time delay switch to allow time for heater and oven to vent.
3. Stop and start switch.
4. Air pressure switch to gas burners to ensure air flow.
5. Air flow switch to ensure air flow from the main fan.
6. Pilot flame protection device.
7. Pilot safety gas valve.
8. Main safety gas valve.
9. Panel board for part of the above control equipment.

In the third type an air gas mixture from a low-pressure or high-pressure inspirator, premix blower, &c., is delivered to a pipe or line burner or special combustion chamber in the form of a radiator. The products of combustion are exhausted from the radiator without being mixed with the air in the oven so that the system is entirely indirect, depending on heat transfer from the radiator surface to the incoming air by radiation and convection. Circulation in the oven can be obtained by a separate fan or natural draught. Special type of radiators can be obtained and placed along the side walls of the oven or, if space does not permit, an external unit can be used.

There are very few processes, if any, where a direct fired gas air heater cannot be used. If a customer feels that an indirect oil or gas fired air heater would be safer to use in a process where volatile flammable thinners are to be removed, one can overcome this obstacle by explaining that in a direct fired application highly explosive concentration of thinner vapours cannot normally be reached because the heater flame ignites any possible explosive mixture present while it is near the lower explosive limit. We should endeavour, whenever possible, to recommend the installation of a direct gas fired recirculating type of heater, which will be explained as we proceed further with this discussion.

The various oven manufacturers have standardized on this equipment so that prices compare quite closely and the various constructions are similar in order to meet insurance regulations.

The dehumidifiers available for dehydrating processes, supply dry air at a low temperature through absorption of the moisture in the air. The relative humidity of the air delivered by the dehumidifiers to the ovens can be controlled within close limits so that the moisture removal capacity of this dry air can be accurately calculated. These units can be successfully applied to low temperature dehydrating processes.

Competitive fuels most commonly encountered in drying and baking operations are electricity, steam, oil, coal, coke, and vapofier.

Electricity is a satisfactory but expensive oven fuel. Due to the high unit fuel cost it does not offer any serious competition.

The use of steam through steam coils in an air heater or mounted on the inside of the oven walls presents the following disadvantages as compared to the use of gas:

1. Low temperature range unless excessive pressures are used. Steam applications are usually limited to low temperature drying, 200°F. and under.
2. Non-flexible temperature control and uneven heat distribution.
3. Low thermal efficiency due to indirect system and excessive radiation losses in steam lines.
4. High initial cost of equipment.
5. High maintenance cost.
6. Additional space required due to boiler and large number of heating coils necessary to furnish sufficient radiating surface.

Steam is usually only economical for an industrial plant which has a large supply of exhaust steam not being used.

The use of oil in an air heater presents the following disadvantages as compared to the use of gas:

1. Non-flexible temperature control and uneven heat distribution.
2. Low thermal efficiency due to indirect system which is most generally required.
3. High initial cost of equipment.
4. High maintenance cost.
5. Difficult to meet insurance safety standards.
6. Additional space required for oil tanks, pumps, &c.
7. Oil spillage, smoke, and oil sulphur content render the fuel unsatisfactory for many applications such as enamel baking, paper drying, &c.

The use of coal or coke presents the following disadvantages as compared to the use of gas:

1. Non-flexible temperature control and uneven heat distribution.
2. Burning characteristics of coal or coke render it unsatisfactory for use even in an indirect fired air heater. This eliminates their use for practically all baking or drying processes except core baking or mould drying operations.
3. Low thermal efficiency due to its general characteristics of utilization and special chamber required in core baking and mould drying.
4. High maintenance cost for grate and refractory replacements.
5. Additional space required for special combustion chamber and fuel storage.
6. Smoke and ashes make it difficult for the customer to maintain a clean and orderly factory.

Assuming we are making a fuel cost comparison, considering gas to be sold at 7.76 cents per therm net, the competitive fuel cost as fired for equal operating costs would be as in the table below:

Fuel	Types of System.	Over-all Heater and Oven Efficiency.	Fuel Cost as Fired for Equal Operating Cost.
Gas	Direct Recirculating.	60% to 65%	7.76c./Therm.
Steam	Indirect Recirculating	20% to 30%	$6.80/Ton.
Oil	Indirect Recirculating	35% to 45%	7.0c./Gal.
Oil	Direct Recirculating	50% to 60%	9.5c./Gal.

This cost comparison is made assuming the ovens to be the same and of fairly good construction such as sheet panel reinforced and insulated. The overall heater and oven efficiency represents actual operating figures as obtained in practice and can be used for the basis of such calculations. The coal and oil heating values were assumed to be 11,000 B.Th.U./lb. and 140,000 B.Th.U./gall. respectively. The comparison was made for recirculating air heater systems in that all new ovens as selected or present ovens to be converted should employ this system if at all possible to give the customer the most for his money. The greatest majority of the air heater applications to-day are using recirculating systems for fuel economy. A saving of 15% to 20% can be realized over the non-recirculating systems.

You will notice that the cost comparison is made on the basis of the fuel as fired. In the case of gas, 7.76 cents per therm represents the delivered price of this fuel as well as the cost as fired. However, in the case of coal and oil this is not true. If steam is used and coal is the fuel used to generate this steam in a boiler, we must deduct from the $6.80 approximately 25 cents per ton for labour and maintenance charges, which means that the coal must be purchased for $6.55 per ton. If oil is used we must deduct 0.5 cent. to 1.0 cent. per gallon as the charge for storage, pumping, unloading, &c., from the price as fired. General practice indicates that a charge of 1.0 cent per gallon on oil for these charges is correct for a small plant and 0.5 cent. per gall. for a large plant. It is our job to convince the customer of these facts in order to obtain a true cost comparison.

Coke fired core baking and mould drying processes offer quite a vast field for prospective business. The common method of firing with coke consists of a firebox or combustion chamber located at the side or underneath the oven, and only natural draught pulling the heat into the oven. With this method of firing one can expect an overall efficiency of about 10% to 15%. Thus, to convert or replace an oven of this type to gas using the direct fired recirculating or even non-recirculating system it is economical for the customer, in most cases, due to the increased thermal efficiency. In making a cost comparison of this type it is considered good practice to charge about $1 per day for labour and maintenance charges against the coke fuel costs to make a true cost comparison. This charge is made up of the following items:

$0.40/Day—1 Hr./Day—for getting wood, coke, lighting, &c.
$0.40/Day—1 Hr./Day—for cleaning furnace, ashes, &c.
$0.20/Day—Maintenance and grate replacements.

$1.00/Day—Total.

If space does not permit the installation of an air heater system in a particular core or mould oven to be converted to gas, one can use a common line burner method of firing and still show the customer a reduction in the final cost of production of the finished product. We can expect an overall efficiency of approximately 35% to 45% for this method of firing as compared with 10% for coke.

Vapofier is also used as a fuel for core baking and mould drying. However, it presents the same disadvantages as oil plus a more serious explosion or fire hazard. Tests have indicated that 20% to 25% less heat is required to fire with gas than with vapofier. The same storage pumping, &c., charges as previously mentioned for oil should be included in a cost comparison.

Oven Insulation

As previously mentioned in the first part of this Paper, except for electricity gas has the highest unit cost based on relative heat units. This means that in order to sell the customer on the use of gas as the proper fuel, we must find ways and means of processing his product with fewer B.Th.U. than with oil, coal, coke, vapofier, or steam.

This can be partly accomplished by insulating the walls, roof, &c., of present uninsulated ovens to be converted or by recommending steel panel insulated construction for new ovens. For example, if you are going to heat a brick oven, it is necessary to supply, in addition to the heat for the material to be processed, an enormous quantity of heat for the losses from the walls, roof, &c., plus that required to bring the walls up to temperature. This can best be explained by studying the actual losses through various types of oven walls. The comparison is made assuming the oven operating temperature to be 350° F. with air surrounding the outside oven walls at 50° F.

	B.Th.U. sq. ft./hr
1. Oven body with 4 in. brick wall	450
2. Oven body with 9 in. brick wall	200
3. Oven body with reinforced steel panel wall 2½ in. rockwool insulation	42
4. Oven body with reinforced steel panel wall 4 in. rockwool insulation	27
5. Oven body with 4 in. of brick wall, plus 1 in. mineral wool block insulation	95
6. Oven body with 4 in. of brick wall plus 2 in. mineral wool block insulation	53
7. Oven body with 9 in. of brick wall plus 1 in. mineral wool block insulation	75
8. Oven body with 9 in. of brick wall plus 2 in. mineral wool block insulation	45

SAWER & PURVES
METERS
HAVE BEEN
GIVING
NATIONAL
SERVICE
SINCE 1869

MEMBERS OF THE INSTITUTION OF BRITISH GAS ENGINEERS 1903

NELSON METER WORKS
MANCHESTER 10
TELE COLlyhurst 2289
SAWER MANCHESTER

also at

Radford Meter Works,
NOTTINGHAM
Telephone : 75202

Derby Road,
WATFORD
Telephone : 2645

These figures are only radiation losses and in addition, as previously mentioned, in the case of a brick oven, you also have the heavy heat absorption equal to the weight of the total number of bricks in the walls multiplied by their specific heat and temperature rise involved. For a brick oven operating at 350° F. assuming the air surrounding the oven to be 50° F., the heat absorption for a one square foot section 9 in. thick would be 3,500 B.Th.U. which is equivalent to 4,600 B.Th.U. per cu.ft. of brick. Through installing 1 in. of mineral wool block insulation on the inside of this brick oven to be converted, the high heat absorption would be reduced from 3,500 B.Th.U. for a one square foot section 9 in. thick to 800 B.Th.U. for a one square foot section 10 in. thick. With a reinforced steel panel insulated wall in the case of a new oven, this heat absorption is reduced to a minimum due to the low specific heat value and density of the insulation.

Therefore, through the installation of 1 in. of mineral wool block insulation on a 9 in. brick wall, the heat loss from the walls has been reduced approximately 62% and the heat absorption has been reduced approximately 77%.

The application of a block or cement insulation to the inside of oven walls is a rather new development and, needless to say, a very important one for those engaged in selling firm high priced gas for drying or baking operations. The installation of such insulation is a very simple procedure and does not require the assistance of specially trained men. The average brick layer or maintenance man is fully competent to do the application work.

When recommending the use of such material you will no doubt be confronted with the problem of explaining to the customer why he should not install the same in his present oven and continue using his present fuel, oil, coal or coke. You can overcome this obstacle by explaining that the products of combustion from a direct fired oil, vapofier, coal or coke system tend to deteriorate the mineral wool block insulation which is not experienced when using gas as the fuel. This is due to the higher sulphur content and other impurities of these fuels and the uneven heat distribution.

Insurance Regulations

In a baking process where the bases of japans, enamels, paint, or varnish contain drying oils, a problem of volatile flammable thinner removal is present. This presents a very hazardous condition of spontaneous heating which might result in fire or explosion unless proper precautions are taken. The thinners such as naphtha and the mineral turpentine substitutes have a flash point of 90° F. to 120° F. and can ignite spontaneously in the presence of hot metals at temperatures as low as 500° F. One per cent. concentration of solvents in air by weight is safe, 2% dangerous and 3% explosive. Reference has already been made regarding the ventilating requirements to ensure safe operation.

In addition to supplying the proper amount of ventilation, there are other items to consider in order to maintain high safety standards such as explosion vent areas, proper oven construction and safety controls. The industrial gas engineer should be familiar with the insurance regulations for the above so that the installation he recommends will meet these requirements.

Conclusion

In conclusion, when we approach the customer to promote the sale of firm gas in drying and baking operations, it is well to bear in mind that we have a higher unit fuel cost second only to electricity, and to induce the customer to adopt our fuel it is necessary to show him not so much a direct saving in fuel cost, but a lower net cost for the finished product, increased quality of product, and a decrease in the actual time required for the process.

This can be accomplished if we use the following procedure:

1. Calculate the heating requirements correctly to size the air heater properly.

2. Recommend a well designed recirculating or non-recirculating air heater to ensure proper circulation of air and heat distribution.

3. Recommend insulating non-insulated ovens to be converted or, in the case of a new oven, well constructed insulated walls, roof, &c.

4. List advantages of gas over competitive fuels.

5. Recommend use of proper safety controls and sufficient oven ventilation.

Gas Undertakings' Results

Chorley

The gas undertaking of Chorley records a net profit of £2,508 for the past financial year, as compared with £3,479 for 1938. The annual report explains that the profit was reduced through the increased cost of coal. Though a number of undertakings had increased their gas charges, Chorley had not. The gas consumption of 306,505,900 cu.ft. was an increase of 29,773,000 cu.ft. Improvements and additions to plant involving an expenditure of over £14,000 are proceeding.

Cleveland

The profit made during the six months to June 30 by the Cleveland Gas Company has been £405, to which has to be added the amount brought forward from the previous half-year, making the balance at the credit of profit and loss account £3,481. The payment of a dividend for the half-year at the rate of 2½% per annum will absorb £498, and leave to be carried forward the sum of £2,983. A year ago the carry-forward was £2,898, and on that occasion £450 out of the profit of £512 was devoted to reserve for repairs to plant and to the contingent fund. The gas sold in the past half-year amounted to 13,305,200 cu.ft., as compared with 12,967,600 cu.ft. in the corresponding six months of 1938.

Kirkcaldy

The annual report on the Kirkcaldy Gas-Works states that there is a deficit of £1,565 for the year. This has been arrived at after deduction of the various charges from the gross profit of £14,270. The quantity of gas made was 297,000,000 cu.ft., this being an increase of 3,876,000 cu.ft. when compared with the previous year.

Oswaldtwistle

The income from gas of the Oswaldtwistle undertaking during the past twelve months was £15,591. The total revenue expenditure and income during the year were £19,768 and £21,761 respectively, leaving a gross profit of £1,992. This compared with a gross profit of £4,452 last year. The total quantity of gas sent out amounted to 105,209,000 cu.ft., an increase of 1,702,000 cu.ft. over 1938.

Pitlochry

Mr. John Marshall presided at the Annual Meeting of shareholders of Pitlochry Gaslight Company on August 28. It was reported the gas output had been well maintained with an increasing demand on account of gas cookers. A satisfactory balance-sheet was approved, and a dividend of 6% declared. Mr. John Marshall and Mr. William Martin, retiring Directors, were re-elected.

St. Helens

For the financial year to March last the St. Helens Corporation Gas Department report a decrease in the quantity of gas sold of 21,003,531 cu.ft., or 1.95%. This, however, follows upon an increase in sales during the preceding year of 4.47%. The total quantity sold in the past twelve months was 1,055,369,747 cu.ft. Of this quantity, 468,775,116 cu.ft. was supplied through prepayment meters, to 26,713 consumers; and 490,816,198 cu.ft. by ordinary meter. The balance appears under power meters, central heating, fish frying and confectionery, and public lighting. The number of consumers on March 31 was 29,135, together with 552 in Rainford—a decrease of 489 as compared with the previous year. Under the St. Helens Gas Order, 1938, the Rainford gas undertaking was transferred to the Corporation. Statistics of consumption show that the falling off has been, practically speaking, entirely under the heading of prepayment meters. The number of prepayment consumers a year ago was 27,213. Central heating is progressing well; the quantity of gas supplied for this purpose having increased during the twelve months from 125,602 cu.ft. to 3,553,091 cu.ft. A gross profit for the year of £30,384 compares with £41,626 a year ago, and after deducting loan and other charges there is a net loss of £102, which it is proposed to meet out of the reserve fund. There will consequently be no profits available for rate aid during the current year. There have been three increases in price of gas during the past two years.

Markets and Manufactures

Current Sales of Gas Products

The London Market

Sept. 18.

At the present moment it is impossible to quote market prices for tar products, but the general tendency is for prices to rise to cover increased costs.

The Provinces

Sept. 18.

Crude Gas-Works Tar, 10s. to 15s.

To avoid misunderstanding, it is necessary to state that the above price is not claimed to represent a market value. It is a price worked out from week to week upon a system which has been used for many years as a basis for the fixing of certain contracts for crude tar of varying qualities in different areas.

The average prices of gas-works products during the week were: Pitch—East Coast, 25s. to 27s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 25s. to 27s.* Toluole, naked, North, 1s. 10d. to 1s. 11d. Coal tar, crude naphtha, in bulk, North 7¾d. to 8¼d. Solvent naphtha, naked, North, 1s. 4½d. to 1s. 5d. Heavy naphtha, North, 1s. 2½d. to 1s. 3d. Creosote, *ex* works, in bulk, North, liquid and salty, 3⅞d. to 4⅛d.; low gravity, 4d. to 4¼d. Carbolic acid, 60's, 1s. 7d. to 1s. 10d. Naphthalene, £13 10s. to £16. Salts, 70s. to 75s., bags included. Anthracene, "A" quality, 4½d. to 4¾d. per minimum 40% purely nominal, "B" quality unsaleable. Heavy oil: Unfiltered anthracene oil, min. gr. 1,080, 4¾d. to 4⅞d.; filtered anthracene oil, min. gr. 1,080, 5¼d. to 5¾d.; heavy tar oil, gr. less than 1,080, 4½d. to 4¾d.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls, whatever they may be.

Scotland

GLASGOW, Sept. 16.

Conditions are so unsettled that makers are at present disinclined to make offers. There is certainly an increased demand but so far as possible distillers are endeavouring to discourage speculative purchases.

Crude gas-works tar.—Actual value is nominal at round 26s. to 28s. per ton *ex* works in bulk.

Pitch of vertical quality can still be secured at 20s. to 21s. per ton f.o.b. for export and 20s. per ton *ex* works in bulk for home trade.

Refined tar is unchanged at 3¼d. to 4d. per gallon in the home market, while for export supplies are offered at 2¾d. to 3d. per gallon, into buyers' packages at makers' works.

Creosote oil.—The following prices can only be taken as approximate: Specification oil, 3½d. to 3¾d. per gallon; low gravity, 4¼d. to 4½d. per gallon; neutral oil, 3¾d. to 4d. per gallon; all *ex* works in bulk.

Cresylic acid.—Offers are difficult to secure and value can only be indicated as follows: Pale, 97/99%, 1s. 5d. to 1s. 6d. per gallon; Dark, 97/99%, 1s. 2d. to 1s. 4d. per gallon; Pale, 99/100%, 1s. 8d. to 1s. 10d. per gallon; all *ex* works in buyers' packages.

Crude Naphtha is quietly steady at 5d. to 5½d. per gallon, *ex* works in bulk, according to quality.

Solvent naphtha.—90/160 grade is 1s. 4d. to 1s. 5d. per gallon and 90/190 heavy naphtha is about 1s. 1½d. to 1s. 2d. per gallon.

Motor benzole is 1s. 3d. to 1s. 4d. per gallon.

Pyridine.—Prices are nominal at 12s. to 13s. per gallon for 90/160 grade and 14s. to 15s. per gallon for 90/140 grade.

Benzole Prices

These are considered to be the market prices for benzole at the present time:

	s.	d.		s.	d.	
Crude benzole ...	0	9½	to	0	10	per gall. at works
Motor ,, ...	1	3	,,	1	3½	,, ,, ,,
90% ,, ...	1	4	,,	1	4½	,, ,, ,,
Pure ,, ...	1	8	,,	1	8½	,, ,, ,,

Le Bas Tube Co. Ltd.

In order to speed up the delivery of GF malleable pipe fittings and the production of cutting and screwing tubes up to 6 in. in all qualities, the Le Bas Tube Co., Ltd., of Billiter Street, E.C.3, have extended their warehouses and machine shop situated at 16, Deansgate, Manchester.

PROTECT WITH

METROTECT

a bituminous paint producing a pleasant satin black finish with highly waterproof and anti-corrosive properties.

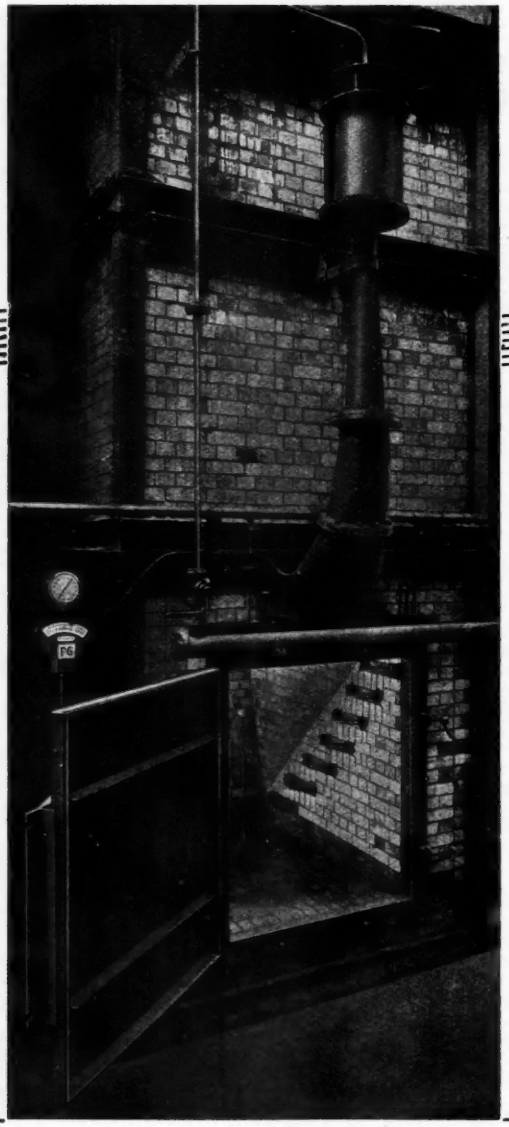
Protects steel-work which is continuously or periodically immersed in water. Does not become brittle on prolonged atmospheric exposure. METROTECT flows freely under the brush and can be applied quickly and without effort even in cold weather.

Prices and further particulars from—

SOUTH METROPOLITAN GAS CO.

PRODUCTS DEPARTMENT,
REGIS HOUSE,
KING WILLIAM STREET,
E.C.4.

MODERN DESIGN—



MODERN

EQUIPMENT

Pressure producer equipment installed with Glover-West vertical retorts for the Leeds Corporation Gas Department (Meadow Lane Works)

West's carbonizing plants combine the features of present-day practice by which the most exacting requirements of retort house control and efficiency are met. The increased fuel economy realised by the introduction of pressure producer equipment is one direction in which the ideal of maximum results from the coal carbonized is attained.

WEST'S

WEST'S GAS IMPROVEMENT CO., LTD. MILES PLATTING, MANCHESTER 10
AND BATH ROAD, HARMONDSWORTH, WEST DRAYTON, MIDDLESEX.

GAS STOCKS AND SHARES

The Stock Exchange has passed through another difficult week. Gilt-edged securities remained throughout at the minimum quotations and it was almost impossible to do business at these levels. The general opinion is that until these prices are reduced or the Bank rate lowered the gilt-edged market will remain frozen. Investors in need of ready cash were compelled, therefore, to sell other securities and this, coupled with fears of extra taxation, led to some heavy falls among industrials. Oil, rubber, and tin shares were in best demand and prices closed at higher levels.

Business in the Gas section has been almost negligible, only forced sales coming into the market and transactions last week were confined to the following at the prices shown: Gas Light Units (16s.-17s. 9d.); 3% deb. (63), 5% deb. (100); Imperial Continental (90-100); South-Eastern £1 (17s. 6d.-19s.); South Metropolitan 3% deb. (60); Tottenham (98-100); and Wandsworth (94½-105). It will be seen in the list below that most of the leading "ordinaries" reacted with margins widening to 10 points and several of the Gas Light fixed-interest stocks were also marked down.

The accounts of the Alliance and Dublin Consumers' Gas Company for the half-year ended June 30 show a gross profit of £74,623 and after providing for interest charges, less a small credit from income tax account, the net profit amounts to £66,424 (against £63,303 for the corresponding half-year of 1938). The Directors recommend a dividend of 4% (the same), which will absorb £70,697 and leave a carry-forward of £12,515 (against £16,788 brought in).

Official Quotations on the London Stock Exchange

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Sept. 15.	Rise or Fall on Week.
1,767,439	Sept. 4	8	8	Alliance & Dublin Ord. ...	125—135	...
374,000	June 19	4	4	Do. 4 p.c. Deb. ...	88—93	...
877,576	May 8	5	5	Ascd. Gas & Water U'd'ts Ord.	16/—18/–	...
500,000	,,	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	18/6—20/6	...
535,545	,,	4	4	Do. 4 p.c. Red. Cum. Pref.	16/—18/–	...
318,730	,,	4	4	Do. 4 p.c. Irred. Cum. Pref.	15/—17/–	...
750,000	Mar. 6	3½	3½	Do. 3½ p.c. Red. Deb. ...	92—97	...
560,070	Aug. 21	7	7	Barnet Ord. 7 p.c.	148—158	..
300,000	Apl. 6	1/4⅜	1/9⅜	Bombay, Ltd.	19/—21/–	...
181,185	Aug. 21	9½	9½	Bournemouth Sliding Scale ...	182—192	...
690,526	,,	7	7	Do. 7 p.c. max. ...	146—151	...
493,960	,,	6	6	Do. 6 p.c. Pref. ...	122—127	...
50,000	June 5	3	3	Do. 3 p.c. Deb. ...	70—75	...
362,025	,,	4	4	Do. 4 p.c. Deb. ...	95—100	...
335,000	,,	5	5	Do. 5 p.c. Deb. ...	110—115	...
357,900	Aug. 21	7½	7½	Brighton, &c., 6 p.c. Con. ...	130—135	...
659,955	,,	6½	6½	Do. 5 p.c. Con. ...	115—120	...
205,500	,,	6	6	Do. 6 p.c. 'B' Pref. ...	108—113	...
855,000	Mar. 20	7	8	British Ord.	100—110	...
100,000	June 19	7	7	Do. 7 p.c. Pref.	136—141	...
350,000	,,	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	110—115	...
120,000	June 5	4	4	Do. 4 p.c. Red. Deb. ...	92—97	..
450,000	,,	5	5	Do. 5 p.c. Red. Deb. ...	100—105	...
450,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	89—94	...
100,000	22 May '33	6	4	Cape Town, Ltd.	¼—⅜	...
100,000	6 Nov. '33	4½	4½	Do. 4½ p.c. Pref.	¼—½	...
150,000	June 19	4½	4½	Do. 4½ p.c. Deb.	58—68	...
626,860	July 17	6	6	Cardiff Con. Ord.	108—113	...
237,860	June 5	5	5	Do. 5 p.c. Red. Deb. ...	102—107	...
98,936	Mar. 20	2/–	2/–	Colombo Ord.	1⅛—1⅜	...
24,510	,,	1/4⅜	1/4⅜	Do. 7 p.c. Pref.	21/—23/–	...
739,453	Mar. 20	–/11.48	–/11.48	Colonial Gas Assn. Ltd. Ord. ...	16/—18/–	...
296,144	,,	1/3.30	1/3.30	Do. 8 p.c. Pref.	21/—23/–	...
1,775,005	July 31	4	4	Commercial Ord.	47—52	...
140,000	Aug. 21	4	4	Do. 4 p.c. Red. Pref. ...	90—95	...
620,000	June 5	3	3	Do. 3 p.c. Deb.	56—61	...
286,344	Aug. 21	5	5	Do. 5 p.c. Deb.	103—108	...
200,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	94— 99	...
807,560	July 31	7	7	Croydon sliding scale	121—126	...
644,590	,,	5	5	Do. max. div.	92—97	...
620,385	June 19	5	5	Do. 5 p.c. Deb.	107—112	...
208,660	Aug. 21	5	5	Dudley, Brierley Hill & Dist. Ord.	100—105	...
82,275	,,	5	5	Do. 5 p.c. Con. Pref. ...	100—105	...
79,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	94—99	...
239,000	July 31	5	5	East Hull Ord. 5 p.c.	86—91	...
187,215	Aug. 21	6	5½	East Surrey Ord. 5 p.c. ...	98—103	...
176,211	June 5	5	5	Do. 5 p.c. Deb. ...	105—110	...
250,000	July 3	4	8	Gas Consolidation Ord. 'B' ...	18/6—20/6	...
250,000	May 22	4	4	Do. 4 p.c. Red. Cum. Pref.	17/—19/–	...
19,172,463	July 31	5⅜	5⅜	Gas Light & Coke Ord. ...	15/—18/–a	–2/3
2,600,000	,,	3½	3½	Do. 3½ p.c. max.	65—70	...
4,477,106	,,	4	4	Do. 4 p.c. Con. Pref. ...	87—92	...
2,993,000	July 3	3⅜	3⅜	Do. 3⅜ p.c. Red. Pref. ...	80—85	–10
8,602,497	May 22	3	3	Do. 3 p.c. Con. Deb. ...	60—65	–4
3,642,770	,,	5	5	Do. 5 p.c. Red. Deb. ...	97—102	–8
3,500,000	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	98—103	–5
700,000	Sept. 4	3½	3½	Do. 3½ p.c. Red. Ded. ...	88—93*	...
270,466	July 31	6	6	Harrogate New Cons.	95—100	...
157,500	Mar. 20	‡1/–	‡1/–	Hong Kong and China Ord. ...	⅝—¾	...
5,600,000	May 8	8	12	Imperial Continental Cap. ...	90—100	–10
172,810	July 31	3½	3½	Do. 3½ p.c. Red. Deb. ...	85—90	...
63,480	June 19	3	3	Maidstone 3 p.c. Deb.	57—62	...
45,000	May 22	†10	†10	Malta & Mediterranean ...	128—133	...
				Metropolitan (of Melbourne) ...		
392,000	Apl. 6	5½	5½	5½ p.c. Red. Deb.	98—103	...
231,977	Aug. 21	5	5	M.S. Utility 'C' Cons.	93—98	...
968,658	,,	4	4	Do. 4 p.c. Cons. Pref. ...	82—87	...
390,076	June 19	4	4	Do. 4 p.c. Deb. ...	90—95	...
148,955	June 19	5	5	M.S. Utility 5 p.c. Deb. ...	105—110	...
125,000	July 3	3½	3½	Do. 3½ p.c. Red. Bds. ...	92—95	...
675,000	May 8	†6	†3	Montevideo, Ltd.	52—62	...
250,000	Aug. 21	7½	7½	North Middlesex 6 p.c. Con. ...	133—138	...
396,160	July 31	5	5	Northampton 5 p.c. max. ...	101—106	...
300,000	April 24	†9	†7	Oriental, Ltd.	135—145	...
468,537	June 5	7	8	Plymouth & Stonehouse 5 p.c.	112—117	...
621,667	July 31	8½	8½	Portsmouth & Gosport Cons.	132—142	...
241,446	,,	5	5	Do. 5 p.c. max.	95—100	...
73,350	,,	5	5	Do. 5 p.c. Pref.	100—105	...
75,000	,,	4	4	Do. 4 p.c. Pref.	81—86	...
114,000	July 31	5	5	Preston 5 p.c. Pref.	100—105	...
247,966	June 19	4	4	Primitiva 4 p.c. Cons. Deb. ...	95—100	...
625,959	July 17	4	4	Do. 4 p.c. Red. Deb. ...	93—98	...
15,000	Sept. 4	6	6	San Paulo 6 p.c. Cum. Pref. ...	7½—8½	–
441,275	May 8	1/1½	1/1½	Severn Val. Gas Cor. Ld. Ord.	19/—21/–	...
460,810	Mar. 20	–/10⅜	–/10⅜	,, ,, 4½ p.c. Cum. Pref. ...	18/6—20/6	...
133,201	Aug. 21	5	8½	Shrewsbury 5 p.c. Ord. ...	107—117	...
9,000	June 5	†4	†4	South African Ord.	4—5	...
1,996,297	Aug. 21	1/2⅜	1/2⅜	South East'n Gas Cn. Ld. Ord.	18/—20/–	–2/–
1,000,000	,,	–/10⅜	–/10⅜	Do. 4½ p.c. Red. Cum. Pref.	18/—20/–	...
769,191	,,	4	4	Do. 4 p.c. Cum. Pref. ...	15/—17/–	...
450,000	,,	4	4	Do. 4 p.c. Deb.	95—100	...
150,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	90—95	...
6,709,895	July 31	6	5	South Met. Ord.	70—80	–2½
1,135,812	,,	6	6	Do. 6 p.c. Irred. Pref. ...	115—120	..
850,000	,,	4	4	Do. 4 p.c. Irred. Pref. ...	80—85	...
1,895,445	June 19	3	3	Do. 3 p.c. Deb.	68—73	...
1,000,000	July 17	5	5	Do. 5 p.c. Red. Deb. ...	103—108	...
600,000	,,	3⅜	3⅜	Do. 3⅜ p.c. Red. Deb. ...	92—97	...
1,543,795	July 31	6	6	South Suburban Ord. 5 p.c. ...	90—100	–4½
512,925	,,	5	5	Do. 5 p.c. Pref.	101—106	...
500,000	,,	4	4	Do. 4 p.c. Pref.	83—88	...
250,000	,,	3⅜	3⅜	Do. 3⅜ p.c. Red. Pref. ...	89—94	...
888,587	June 5	5	5	Do. 5 p.c. Deb.	105—110	...
250,000	,,	4	4	Do. 4 p.c. Deb.	89—94	...
200,000	July 31	3½	3½	Do. 3½ p.c. Red. Deb. ...	89—94	...
427,859	Apl. 6	9⅜	1/2⅜	S. Western Gas & Water Ord.	15/—17/–	...
160,523	Apl. 6	–/10⅜	–/10⅜	Do. 4½ p.c. Red. Cum. Pref.	18/6—20/6	...
110,000	June 5	4	4	Do. 4 p.c. Red. Deb. ...	92—97	...
750,541	July 31	5½	5	Southampton Ord. 5 p.c. ...	100—105	...
148,836	June 5	4	4	Do. 4 p.c. Deb.	89—94	...
350,000	July 31	5½	5½	Swansea 5½ p.c. Red. Pref. ...	102—107	...
200,000	June 19	3½	3½	Do. 3½ p.c. Red. Deb. ...	89—94	..
1,076,490	July 31	6½	6½	Tottenham and District Ord....	90—100	–5½
409,835	,,	5½	5½	Do. 5½ p.c. Pref.	108—113	...
62,235	,,	5	5	Do. 5 p.c. Pref.	100—105	...
453,380	June 19	4	4	Do. 4 p.c. Deb.	87—92	...
85,701	June 5	6	6	Tuscan 6 p.c. Red. Deb. ...	95—100	...
1,247,505	May 8	4	6	U. Kingdom Gas Cor. Ord. ...	15/—17/–	...
1,085,952	May 8	4½	4½	Do. 4½ p.c. 1st Cum. Pref. ...	17/—19/–	...
772,709	,,	4	4	Do. 4 p.c. 1st Red. Cum. Pf.	17/6—19/6	...
745,263	June 5	4½	4½	Do. 4½ p.c. 2nd Non-Cum. Pf.	13/6—15/6	...
1,093,656	Mar. 6	3½	3½	Do. 3½ p.c. Red. Deb. ...	92—97	...
378,106	Mar. 6	7	7	Uxbridge, &c., 5 p.c.	117—122	...
133,010	,,	5	5	Do. 5 p.c. Pref. ...	90—100	–7½
1,371,138	July 31	7	6½	Wandsworth Consolidated ...	107—112	...
2,525,768	,,	4	4	Do. 4 p.c. Pref.	77—82	–5
1,343,964	June 19	5	5	Do. 5 p.c. Deb.	103—108	...
383,745	,,	4	4	Do. 4 p.c. Deb.	89—94	...
400,000	,,	3⅜	3⅜	Do. 3⅜ p.c. Red. Deb. ...	92—97	...
558,342	July 31	6⅛	6⅛	Watford and St. Albans Ord. ...	95—105	–9½
200,000	,,	5	5	Do. 5 p.c. Pref.	100—105	...
200,000	,,	5½	5½	Do. 5½ p.c. Pref.	106—111	...
200,000	,,	4	4	Do. 4 p.c. Rd. Pf. (1973/8)	90—95	...
100,000	—	—	—	Do. 4 p.c. Red. Pf. (1959)	97—102	...
200,000	June 19	4	4	Do. 4 p.c. Red. Deb. ...	95—100	...
200,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	83—88	...

a.—The quotation is per £1 of Stock. * Ex. Div. † Paid free of income-tax. ‡ For year. § Actual.

Supplementary List and Provincial Exchanges overleaf.

STOCK AND SHARE LIST—Contd.

Supplementary List, not Officially Quoted, London

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Nominal Quotations Sept. 15.	Rise or Fall on Week.
202,152	Sept. 4	5	5	Ascot Ord.	95—100*	...
128,182	July 3	5	5	Do. 5 p.c. Pref.	101—106	...
31,035	Aug. 21	-/4⅛	-/4⅛	Associated Utilities 4 p.c. Pref.	15/—17/-	...
100,000	June 19	3⅛	3⅛	Do. 3½ p.c. Red. Deb. ...	93—98	...
17,000	Aug. 21	8	8	Bognor Orig. Ord. 'A' ...	137—147	...
62,210	,,	8	8	Do. New Add. 'A' ...	137—147	...
87,160	,,	7	7	Do. New 7 p.c. max. ...	132—142	...
37,440	July 31	10	10	Cam. Univ. & Town 10 p.c. max.	160—170	...
125,970	,,	7	7	Do. 7 p.c. max.	115—125	...
39,025	,,	5	5	Do. 5 p.c. max.	95—100	...
96,410	July 17	4½	4½	Cardiff 4½ p.c. Pref. ...	92—97	...
55,520	July 31	6	6	Colchester 6 p.c. Pref.	113—118	...
90,550	Mar. 20	5	5	Do. 5 p.c. Deb. ...	103—108	...
150,000	July 31	4	4	Croydon 4 p.c. Pref.	84—89	...
130,000	June 19	4	4	Do. 4 p.c. Deb.	90—95	...
65,000	Aug. 21	7½	7½	Eastbourne 'A' 5 p.c.	120—130	...
198,000	,,	6	6	Do. 'B' 3½ p.c.	103—113	...
112,312	,,	5	5	Do. 5 p.c. Pref.	100—105	...
130,000	June 19	5	5	Do. 5 p.c. Deb.	105—110	...
130,500	Aug. 10	7½	7½	Exeter New Ord. (£10) ...	13½—15½	...
24,000	Aug. 21	8½	8½	Gt. Yarmouth 8½ p.c. max. (£30)	24—29	...
59,400	,,	7½	7½	Do. 7½ p.c. max. (£30) ...	26—31	...
51,160	June 5	5½	5½	Do. 5½ p.c. Deb.	115—120	...
152,600	Sept. 4	9	8	Guildford Cons.	145—155*	...
54,055	,,	5	5	Do. 5 p.c. Pref.	100—105*	...
68,250	June 5	5	5	Do. 5 p.c. Deb.	103—108	...
156,600	Aug. 21	7	7	Hampton Court Cons. ...	100—110	...
86,046	June 19	‡4½	‡5	Holyh'd&N.W.G.&W.Cpn.Ord.	13/6—15/6	...
80,000	Aug. 21	4	4	Lea Bridge 4 p.c. Pref.	78—83	...
60,000	,,	6	6	Do. 6 p.c. Pref.	113—118	...
94,876	June 5	4	4	Do. 4 p.c. Deb.	87—92	...
73,620	Mar. 6	8¾	8¾	Luton Cons. 'A'	150—160	...
107,960	Mar. 20	4	5½	Mid Kent Ord. (£10)	8½—9½	...
230,940	July 31	10	10	Oxford & District Ord. ...	145—155	...
47,112	,,	5	5	Do. 5 p.c. Pref.	95—105	...
50,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	106—111	...
126,193	May 8	7½	7½	Peterborough Ord.	134—139	...
64,990	Mar. 6	7½	7½	Redditch Ord.	115—125	...
166,850	July 31	8	8	Romford Ord.	137—142	...
60,000	,,	4	4	Do. 4 p.c. Pref.	95—100	...
44,000	Mar. 20	5	5	Do. 5 p.c. Deb.	107—112	...
25,570	July 31	5½	5½	Rugby 5½ p.c. Pref.	116—121	...
25,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	103—108	...
42,750	June 5	5½	5½	Do. 5½ p.c. Deb.	113—118	...
110,950	Aug. 21	8	8	Ryde Ord.	137—147	...
270,086	Sept. 4	7	7	Slough Ord.	120—130*	...
21,000	June 5	5	5	Do. 5 p.c. Deb.	103—108	...
28,872	May 8	5½	5½	S. Midland Gas Cpn. Ltd. Ord.	16/—18/-	...
28,866	Mar. 6	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	17/—19/-	...
117,228	Aug. 21	7	5	Swindon Cons.	98—103	...
60,425	June 5	5	5	Do. 5 p.c. Deb.	103—108	...
64,380	June 19	5	5	Torquay & Paignton 5 p.c. Pref.	102—107	...
130,000	Aug. 21	8	5	Wakefield Ord.	101—106	...
81,650	,,	5	5	Do. 5 p.c. max.	81—86	...
82,000	July 31	6	6	Weymouth Ord.	101—106	...
273,626	Aug. 21	7	7	Wolverhampton Cons. Ord. ...	126—131	...
98,384	,,	6	6	Do. 6 p.c. Pref.	113—118	...
160,000	June 19	5½	5½	Do. 5½ p.c. Red. Deb. ...	102—107	...
106,490	Aug. 21	5½	5½	Wrexham Ord.	89—94	...
90,000	June 19	5	5	York 5 p.c. Red. Deb.	102—107	...
133,640	July 31	6½	6	Yorktown (Cam.) 5 p.c. Cons.	112—117	...
120,000	,,	5	5	Do. 5 p.c. Pref.	100—105	...
35,000	June 19	5½	5½	Do. 5½ p.c. Deb.	110—115	...

BRISTOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Sept. 15.	Rise or Fall on Week
347,756	July 31	6	5	Bath Cons.	113—115	...
1,667,250	,,	5	5	Bristol, 5 p.c. max.	105—107	-1
120,420	June 5	4	4	Do. 1st 4 p.c. Deb.	96—100	...
415,250	,,	4	4	Do. 2nd 4 p.c. Deb. ...	96—100	...
328,790	,,	5	5	Do. 5 p.c. Deb.	113—116	...
274,000	July 31	5	5	Newport (Mon.) 5 p.c. max. ...	93—95	...
13,200	Sept. 4	8⅝	7	Pontyp'l Gas & W. 10 p.c. 'A'	12⅛—13⅛*	...
13,600	,,	6	5	Do. 7 p.c. 'B'	10⅛—11⅛*	...
40,000	,,	6	5	Do. 7 p.c. 'C'	10⅛—11⅛*	...
140,778	July 31	5	5	Weston-super-Mare Cons. ...	102—104	...
64,338	June 19	4	4	Do. 4 p.c. Deb.	97—99	...
33,340	,,	7½	7½	Do. 7½ p.c. Deb.	146—150	...

LIVERPOOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Sept. 15.	Rise or Fall on Week
157,150	July 31	6½	5	Chester 5 p.c. Ord.	105—108	...
92,500	June 5	4	4	Do. 4 p.c. Pref.	85—90	-8½
36,430	,,	3½	3½	Do. 3½ p.c. Deb.	86—89	...
41,890	,,	4	4	Do. 4 p.c. Red. Deb. ...	96—100	...
2,167,410	Aug. 21	6	6	Liverpool 5 p.c. Ord.	111—113	...
245,500	June 19	5	5	Do. 5 p.c. Red Pref. ...	100—105	...
306,083	July 17	4	4	Do. 4 p.c. Deb.	99—101	...
106,280	July 31	10	10	Preston 'A' 10 p.c.	174—184	...
188,219	,,	7	7	Do. 'B' 7 p.c.	126—136	...

NEWCASTLE EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Sept. 15.	Rise or Fall on Week
122,577	Aug. 21	8	8	Blyth 5 p.c. Ord.	146½—148½	...
732,000	Aug. 21	3	4	Hartlepool G. & W. Cn. & New	74½—76½	...
2,061,315	July 31	5¾	5	Newcastle & Gateshead Con.	20/—21/—a	...
682,856	,,	4	4	Do. 4 p.c. Pref.	83—88	-½
776,706	June 5	3½	3½	Do. 3½ p.c. Deb.	83—84	...
277,285	April 24	5	5	Do. 5 p.c. Deb. '43 ...	100—105	+½
332,351	Aug. 21	6	6	Sunderland 6 p.c. max. ...	126—128	...

NOTTINGHAM EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Sept. 15.	Rise or Fall on Week
542,270	Aug. 10	9	6	Derby Con.	130—135	...
55,000	June 19	4	4	Do. 4 p.c. Deb.	100—105	...
20,000	June 19	5	5	Long Eaton 5 p.c. Pref. ...	9—11	-1
80,000	,,	5	5	Do. 5 p.c. Deb. ...	100—105	-2

SHEFFIELD EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Sept. 15.	Rise or Fall on Week
10,000	Aug. 21	10	10	Great Grimsby 'A' Ord. ...	180—190	...
6,500	,,	10	10	Do. 'B' Ord. ...	180—190	...
79,000	,,	10	10	Do. 'C' Ord. ...	175—185	...
1,806,339	Feb. 20	6½	6½	Sheffield Cons.	131—134	-2
95,000	July 3	4	4	Do. 4 p.c. Deb.	99—101	...

a The quotation is per £1 of Stock.
* Ex. div. ‡ For year.

PUBLISHERS' NOTICE

TERMS OF SUBSCRIPTION

United Kingdom & Ireland : Advance Rate, 35/- per annum ; 18/- per half year. Credit Rate : 40/- per annum ; 21/- per half year.
Dominions & Colonies & United States : 35/- per annum, in advance. Other countries in the Postal Union, 40/- per annum, in advance.

A copy of the "G.J." Calendar and Directory is presented to continuous subscribers.

CLASSIFIED ADVERTISEMENTS

Situations Wanted, 6d. a line (minimum 3/-, about 36 words). Situations Vacant, Plant for Sale and Wanted, Contracts, Public Notices, Educational, &c., 9d. a line (minimum 4/6). Financial Notices, 1/- per line. Box Number, 6d. extra.

WALTER KING, LTD.,

Telephone : Central 2236-7-8. 11, BOLT COURT, FLEET STREET, LONDON, E.C.4. Telegrams : Gasking, Fleet, London.

War Time Address : "Cluny Lodge," Sandown Avenue, Esher, Surrey. Phone : Esher 747